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**Refresher Article No. 18**

## Diseases of the Canine Eye

BY

**F. G. STARTUP**
**Worthing**

### Part II

### The Eyeball

*Congenital Abnormalities*

*Anophthalmos*, or complete absence of the eyes, is rare.

*Cryptophthalmos*, a condition in which the chiasma, corpora quadrigemina and optic nerve are normal, but in which the eyeball is either absent or seen as a small, pigmented cyst, may be either unilateral or bilateral. It has been recorded in the Old English Sheepdog and the Fox Terrier.

*Microphthalmos* is a congenital condition in which the optic cleft fails to fuse, so that the eye remains small and may be cystic. It may be unilateral or bilateral, usually for former, and may be associated with strabismus, aniridia or nystagmus. It is a relatively common abnormality, seen most often in the Pekingese.

*Hydrophthalmos*, in which there is excess fluid in the anterior chamber, and bulging of the eyeball, is caused by errors at the filtration angle and excessive thinness of the cornea or sclera.

*Megalophthalmos*, a rare condition, is one in which the eye is excessively large, without the presence of hydrophthalmos.

*Exophthalmos*, or protrusion of the eyeball, is normal, to a degree, in such breeds as the Pekingese, Japanese Spaniel and King Charles Spaniel.

*Enophthalmos*, or sinking of the eyeball, is usually found with microphthalmos.

*Strabismus*, or squint, is seen in the Pekingese and Boston Terrier, and may be either convergent or divergent.

*Trauma of the Eyeball*

Injury to the eyeball is not common, due to its protection within the orbit, but may be seen associated with shotgun wounds, blows and kicks. The eyeball may be injured by compression or fracture of the orbital ring. Sub-conjunctival haemorrhage may be caused by contusion.

Simple wounds are treated by saline cleansing and antibiotic dressings. Extensive injury may lead to a panophthalmitis.

Burns and scalds are occasionally seen from boiling fat and water, lime, acids and disinfectants. Acids require neutralisation with sodium bicarbonate, whereas lime burns are best treated with dilute vinegar, both cases being followed by the frequent application of sterile liquid paraffin.

*Prolapse of the Eyeball*

Prolapse of the eyeball is most commonly seen in the brachycephalic breeds, due to pressure on the supra-orbital fossa during fights or street accidents, but may be seen in other breeds when the orbital ligament is ruptured.

The condition is usually unilateral, and the prolapsed eyeball will quickly become inflamed and congested as the eyelids close behind it. Desiccation of the cornea follows, together with oedema of the conjunctiva and, sometimes, haematoma formation. In some cases, the eyeball may be perforated or ruptured.

Replacement of the eye must be performed immediately, for the dry cornea soon becomes ulcerated and the prolapse of the eyeball causes damage to the optic nerve.

An attempt must be made to replace the eye, firstly through the palpebral orifice and then into the orbit, lubricating it well first, and then drawing the eyelids over the prolapse. A canthotomy may have to be performed, or sutures may be inserted through the lids to apply traction.

Once replaced, any tendency to prolapse again can be counteracted, either by suturing the lids together with Lembert sutures over a gauze pad ; by suturing the membrana nictitans to the skin above the upper lid ; or by forming a conjunctival flap around the eyeball and securing this with a purse-string suture.

*Exophthalmos*

Acquired displacement of the eyeball anteriorly may be due to fracture of the orbital ring, post-orbital abscess, haematoma or neoplasia, tumours involving the oculomotor muscles or strangulation. Exophthalmic goitre is rare in the dog.

*Enophthalmos*

Any debilitating condition, resulting in absorption of the post-orbital fat, will produce an acquired enophthalmos. Other possible causes are eosinophilic myositis, in the later stages when the muscles have atrophied ; irritation of the cornea causing reflex contraction of the retractor bulbi muscle ; or trauma to cranial nerves resulting in atrophy of the temporal, masseter or pterygoid muscles.

*Panophthalmitis*

Suppuration within the eye, involving all the coats of the eyeball as well as of its contents, may be endogenous in origin, the infection entering via the blood stream ; or exogenous, due to penetrating wounds of the cornea, corneal ulceration, shotgun wounds, burns or neoplasia. A possible sequel is meningitis as an extension of the infection through the ophthalmic veins.

Treatment is by excision of the eyeball and the control of infection with antibiotics.

*Strabismus*

Squint in the dog is usually congenital, but other cases may be seen associated with virus infections, perforation of the ear tympanum, cerebral disorders, morphine and alkaloid poisoning and rabies.

Strabismus may be either vertical, horizontal or oblique, the commonest type in the dog being horizontal. Most commonly, this is convergent, although the Pekingese and the Pug will more often exhibit a divergent squint. It may be either unilateral or bilateral.

Congenital strabismus may be treated surgically, but the results are often disappointing. In this operation, the conjunctiva and Tenon's capsule are incised, a strabismus hook is inserted beneath the appropriate muscle, and the muscle is divided close to its sclerotic insertion. In convergent strabismus, the internal rectus muscle is severed, whereas in divergent strabismus, the external rectus muscle is divided.

*Nystagmus*

A rhythmical oscillation of the eyes, invariably bilateral, may be seen in cases of convulsions, chorea and disorders of the cerebrum and cerebellum. In the dog, it is seen most frequently in cases of cerebral haemorrhage.

*Excision of the Eyeball*

Removal of the eye is indicated in the following cases :—

1. Large ocular wounds, particularly if the lens is displaced.
2. Excessive loss of vitreous, or extensive prolapse of the uveal tract.
3. The presence of a large foreign body within the eye.
4. Panophthalmitis.
5. Hydrophthalmos that cannot be corrected surgically.
6. Some cases of orbital neoplasia.
7. Some cases of prolapse of the eye.

*Evisceration* of the eyeball is undertaken usually when an artificial eye is contemplated. In this operation, the cornea and the whole contents of the eyeball are removed, leaving the conjunctiva and musculature intact. The remaining tissues partly fill the orbital cavity after healing has taken place.

An incision is made at the limbus, and the cornea is removed, allowing the intra-ocular fluids to escape. The uvea is then removed by a curette, and the cavity is packed with adrenaline-soaked gauze.. If no artificial eye is to be inserted later, the eyelids are then trimmed and sutured together, leaving a gap at the nasal canthus through which the gauze strip is brought out. The gauze is removed after 24 hours, and irrigation of the cavity can be carried out through the opening if required. If an artificial eye is to be used, the eyelids are sutured together without the preliminary trimming.

*Enucleation* is carried out when it is desired to remove the conjunctiva and the eyeball, but leave intact most of the oculomotor muscles and the whole of both eyelids.

The bulbar conjunctiva is incised, at the limbus, for the whole circumference of the eyeball, the connective tissue between the sclera and the conjunctiva is broken down, Tenon's capsule is incised, and the extrinsic muscles are divided close to their insertions. The eyeball is then withdrawn as far as possible, and the retractor bulbi and optic nerve severed as far back as possible. Haemorrhage from the central artery of the nerve is controlled by forceps pressure and packing, and the lids are then trimmed and sutured.

Beamer (1957) advises subconjunctival ablation, in order to leave the conjunctiva intact to form a partition directly behind the sutured lids, to help in preventing a sunken socket. In this technique, the incision is made at the limbus, and the conjunctiva reflected from the sclera. The muscles are severed at their scleral insertions, the optic nerve exposed and severed with a tonsil snare. The eyeball is then removed and the edges of the conjunctiva are drawn together with Lembert catgut sutures. The third eyelid is then removed, the conjunctiva repaired and the lids trimmed and sutured.

*Extirpation* is the operation of choice where there is suppuration within the eyeball or a panophthalmitis, for it avoids the spread of infection. Both eyelids are completely removed and the whole of the orbital contents extirpated, including all of the conjunctiva and the oculomotor muscles.

The eyelids are first sutured together. The skin surrounding the eyelids is then incised between the insertion of the eyelids and the orbital ring. The eyelids are dissected away, leaving the conjunctiva intact, and a spatula is passed round the orbital cavity to break down any connections. The eyeball is drawn forward, the optic nerve and the muscles

severed with long curved scissors, and the skin is sutured. Plugging is not usually necessary.

A disadvantage of this technique is the subsequent sinking, leaving a large and rather noticeable cavity.

*Artificial Eyes*

Artificial globes, made either of glass, vulcanite or plastic, either solid or with a hollow posterior surface, can be used in the dog, but may be resented, and may become increasingly difficult to remove and replace.

Insertion must not be attempted for at least 3 or 4 months after excision of the eye, to allow the cavity to reach maximum contraction. At first, they should be left in position for only an hour or two, gradually increasing the time until they are worn permanently. They must be removed for cleansing, however, at frequent intervals.

*Intra-scleral Plastic Prosthesis*

Simpson (1956b and 1956c) describes the use of this technique, which is suitable in panophthalmitis, hydrophthalmos and most cases of traumatic loss of eye. It is not suitable where the blood supply to the globe is severed, where the extra-ocular muscles are ruptured deep in the orbit or where infection is coexistent with excessive scleral trauma.

The prosthesis, which has a standard corneal diameter of 15 mm. is covered in its posterior part with a tantalum mesh, moulded into the plastic at its free borders. It is sterilised chemically.

A canthotomy is performed and the eyeball is eviscerated, taking care that all uveal tissue is removed. The bulbar conjunctiva is then separated from the sclera at the limbus to allow these two structures to be sutured to the prosthesis separately. The sclera is incised posteriorly, to allow the insertion of the prosthesis, which is placed in an introducer and orientated. The blades of the introducer are placed within the sclera and the prosthesis deposited in the cavity. Fixation is maintained by interrupted catgut sutures, approximating first the sclera to the tantalum mesh, and then the conjunctiva.

The operation is followed by extensive oedema for 7 to 10 days, and by a marked conjunctivitis for 21 to 28 days. Following this operation there is an increased susceptibility to conjunctivitis which needs constant supervision. Neglect of conjunctivitis will lead to separation of the conjunctiva from the tantalum, and the prosthesis may be extruded if this separation is not dealt with promptly and adequately.

Lewis (1959) advises that the operation be done in two stages and suggests that this will avoid most of the undesirable reactions and discomfort. He uses an optically clear methyl mathacrylate lens moulded over a painted iris and pupil. The prosthesis, also, is made of the same plastic, with tantalum type 50 mesh drawn over it and secured by a tantalum wire circlip.

The first operation consists of the removal of the cornea and uveal tract, following which the cavity is treated with antibiotics and the lids are sutured. At the second operation, which is performed 6 to 10 days later, the sutures are removed, the conjunctiva is dissected from the sclera at the limbus and the prosthesis is inserted. The conjunctival edge is then sutured to the edge of the mesh at the rim of the prosthesis, and the outer canthus is sutured for 1 week.

## Glaucoma

Glaucoma is a disease of the eye, characterised by the development of increased intra-ocular pressure. This increase may be primary, that is, unassociated with any other intra-ocular disease ; or secondary, that is, following a pre-existing disease of the eye, or as a complication of some damage to the eye.

*Primary Glaucoma*

In the absence of subjective symptoms, the early diagnosis of primary glaucoma may be made only when there is no other discernible secondary condition within the eye that could lead to an increase in tension.

The aqueous humour, formed by the secreting cells of the ciliary epithelium, is drained via the spaces of Fontana, centered in the angle of filtration, and then through the canal of Schlemm and the suprachoroidal space into the venous sinuses. Any lack of balance between the secretory and drainage systems will result in the formation of glaucoma, and such an inbalance may result from increased aqueous secretion, or from some hindrance to or obstruction of the drainage system. An increase in aqueous secretion may result from abnormality of the ocular secretion, either as a localised condition or because of disturbance in the general circulatory system, and contributing factors may be disorders in the hypothalamus, A.N.S. or endocrine glands (Magrane, 1957b).

It would seem that, in primary glaucoma, an hereditary factor, dominant or recessive, may be involved, and Magrane (1957b) reports that, in the U.S.A., primary glaucoma is seen almost exclusively in the Cocker Spaniel, and in a preponderance of females. The condition has, nevertheless, been reported in other breeds by authors in other countries.

(*a*) *Acute congestive glaucoma* is sudden in onset and all the congestive signs are pronounced. This is the so-called " narrow-angle glaucoma " in man, when it occurs in eyes with a shallow anterior chamber. The acute congestive type is the type normally found in the dog, and it is possible that a narrow iris angle is the predisposing factor. It is not known if the angle is congenitally narrow, or if it becomes so as the result of previous attacks. The prodromal stage, the symptoms of which are entirely subjective, is, of course, absent in the dog, and the stage of evolution is usually sudden in onset. If untreated, this will lead to absolute glaucoma and finally ocular degeneration.

Acute congestive glaucoma tends to occur in dogs between the ages of 3 and 9 years and, in the first instance, is usually unilateral, although the second eye is normally involved within a year of the first attack.

The affected eye is extremely painful, the lids are half closed and the third eyelid is prominent. Examination may be difficult due to blepharospasm and narcosis or anaesthesia may be required in order to complete the examination. The cornea, which is insensitive, is cloudy, due to oedema, and often small punctate opacities are present. The conjunctiva is congested, the episcleral veins very prominent, and

there may be some chemosis. The iris is widely dilated and insensitive to light. Digital tonometry reveals a marked increase in intra-ocular pressure and there is loss of vision. Examination of the fundus is not usually possible, due to corneal opacity, but, if possible, reveals atrophy of the optic disc, constriction of the retinal arteries and engorgement of the veins. The " cupping " of the optic disc, characteristic of the disease in man, is not evident in the dog, because of the absence of a true lamina cribrosa.

If not treated, the acute phase may subside, leaving some loss of vision, but further attacks will inevitably take place at a later date.

(*b*) *Chronic congestive glaucoma* may result from previous acute attacks. The changes in the eye are similar to the acute form, but less intense, and some vision may remain.

(*c*) *Non-congestive glaucoma*, the so-called " wide angle glaucoma " of man, does not appear to have been recorded in the dog.

(*d*) *Absolute glaucoma* will result in complete loss of vision as it develops. The congestive symptoms are no longer present, although the episcleral veins are more prominent. The pupil remains fully dilated and the cornea is usually clear. Atrophy of the iris and the disc is evident and increased intra-ocular tension is noticeable. Pain is either absent or periodic and the eye will appear proptosed due to the development of hydrophthalmos.

Absolute glaucoma is followed by degeneration. The cornea may ulcerate and panophthalmitis may result from corneal perforation. Alternatively, corneal opacities and secondary cataract may develop and the eye becomes soft and shrinks due to atrophy of the ciliary epithelium and the non-formation of aqueous humour.

*Secondary Glaucoma*

Secondary glaucoma, occurring as a complication of some other ocular disease, or of damage to the eye, may have either a neurovascular or a mechanical origin. It results from the obstruction of the flow of aqueous humour, which in turn may be due to luxation or subluxation of the lens, anterior and posterior uveitis or choroiditis, anterior or posterior synechia or some forms of cataract. It may also follow cataract extraction.

(*a*) *Subluxation and luxation of the lens.* The movement of the lens brings it into contact with the ciliary processes, and the subsequent irritation and oedema leads to increased aqueous formation. With anterior subluxation, the root of the iris may press against the cornea, partially blocking the filtration angle. If the lens is wholly in the anterior chamber it may itself interfere with the flow of aqueous. A posterior luxation may cause the vitreous to be pushed forward into the pupillary space.

Heeley (1958) considers that phacolytic glaucoma is likely to result from luxation of the lens. This is dependent on liquified lens material leaking out into the anterior chamber, through the capsule of a Morgagnian, or hypermature, cataract. This lens material provokes a phagocytic response, and the engorged cells, having ingested the material, are carried to the filtration angles where they cause mechanical blocking.

Magrane (1957c) states that some primary cases in Cocker Spaniels may develop luxation later through prolonged tension increase and stretching of the ocular structures.

(*b*) *Uveitis.* This may be a primary cause of secondary glaucoma, or may result in synechia which produce glaucoma.

(*c*) *Anterior and posterior synechia.* Anterior synechia, that is, adhesions of the iris to the posterior surface of the cornea, result from anterior uveitis or a perforating corneal wound. Posterior synechia, that is, adhesions of the pupil margin to the anterior lens surface, arise from inflammation of the iris or ciliary body.

Anterior synechia may obliterate the angle of the anterior chamber. Posterior synechia prevent the forward passage of aqueous. This is particularly so in the condition of seclusio pupillae, in which the whole of the pupil margin is adherent to the lens. An increase in pressure in the posterior chamber develops, causing the middle part of the iris to protrude forward (iris bombé), resulting in the root of the iris being pressed against the cornea with subsequent blockage of the angle.

Occlusio pupillae will result when a cellular exudate is deposited from the iris on to the anterior surface of the lens, so as to occupy the whole of the pupil. eventually being organised into a fibrous membrane.

(*d*) *Hypermature cataract.* The cortex in a hypermature cataract may become liquified (Morgagnian cataract) and may rupture. This may result in glaucoma due either to the irritation from the lens substance ; an increase in the protein content of the aqueous, altering the osmotic pressure difference between aqueous and serum ; or due to mechanical angle obstruction by particles of lens substance.

(*e*) *Post-operative.* Glaucoma may follow cataract extraction, due either to iris prolapse, hyphaemia, the presence of cortical lens remnants, incarceration of the lens capsule, vitreous prolapse, post-operative iridocyclitis or post-operative oedema.

Wounds, whether traumatic or operative, may produce adhesions and subsequent drainage block ; or a downgrowth of epithelium into the wound, so that eventually these cells line the whole anterior chamber and so prevent filtration.

Magrane (1957c) quotes, as other causes of secondary glaucoma, essential iris atrophy, which tends to cause blockage of the angle with iris debris ; and lenticular intumescence, occurring in eyes with a narrow angle when a cataract is developing. This causes a shallow anterior chamber, and the swelling may press the iris against the trabecular wall. It must be noted that a tension increase may *produce* iris atrophy.

*Treatment*

The treatment of glaucoma, which may be either medical or surgical, is often unsatisfactory, and the development of hydrophthalmos will often necessitate enucleation of the eye. Medical treatment is of value in acute congestive attacks, to " normalise " tension,

and is of value pre-operatively to make the eye softer and less inflamed.

(*a*) *Medical treatment.* This is based on two factors —miotics, to open the angle of filtration and the posterior venous chambers, and to constrict the blood supply of the ciliary body ; and drugs given internally —the carbonic anhydrase inhibitors—to inhibit the formation of aqueous. With the aid of these drugs, miosis is easier to obtain, and the angle becomes unblocked.

The miotics that may be used are eserine and pilocarpine, but the degree of miosis that they will produce in glaucomatous eyes is very limited. Magrane recommends the use of di-isopryl fluorophosphate* as a 0·1 per cent. solution, which will often lower, if not normalise, tension, particularly if combined with a carbonic anhydrase inhibitor. The scheme recommended is one drop every hour for 6 installations, followed by twice or thrice daily applications, which may be maintained for long periods.

The carbonic anhydrase inhibitors should always be used in conjunction with a miotic, with which they work synergistically, for, although they will inhibit the formation of aqueous, they have no effect on outflow. They are most useful in acute, narrow-angle glaucoma and in glaucoma secondary to uveitis.

Acetazoleamide† (2-acetylamino-1, 3, 4, thiodiazole-5, sulphonamide) is given in a dose, for a 20 to 30 lb. dog, of 125 mg. every 8 hours for 3 doses, followed by 125 mg. every 12 hours.

Dichlorphenamide‡ (1, 3-disulphamy 1-4, 5-dichlorobenzene) is given at the rate, for a 20 to 30 lb. dog, of 25 mg. every 8 hours.

These inhibitors, which may be maintained for long periods if necessary, seem to have a variable effect in the dog, being sometimes effective for months, and sometimes only for weeks. Their use is suggested in the initial stages of glaucoma and as a preliminary to surgery.

(*b*) *Surgical treatment.* Whilst medical treatment is useful in the early stages, its effect is sometimes only transient, and surgical interference is indicated in order to lower the intraocular tension and preserve vision. Specific surgical procedures are obviously necessary in certain types of secondary glaucoma, for example, in luxation of the lens ; and, in absolute glaucoma, preservation of the globe is sometimes preferred to enucleation. The type of surgical interference indicated will vary according to the cause of the glaucoma.

(1) *Iridectomy* is indicated in the early stages of primary glaucoma in order to prevent the formation of anterior synechia ; and is also of use if the cause of the glaucoma is an iris bombé. This procedure helps by deepening or opening the filtration angle. In iris bombé it provides a passage for circulation of the aqueous between anterior and posterior chambers. Iridectomy in the dog is invariably followed by haemorrhage from the cut surface, and steps must be taken to control this.

(2) *Filtering cicatrix.* The object of this procedure is to form a permanent filtering point at the corneo-scleral junction, through which aqueous filters out under the conjunctiva. The favourable results obtained are not always permanent, although Magrane reports success in cases of primary glaucoma, iris bombé, uveitis and adhesions. Many methods of producing a filtering cicatrix are described, and, of these, the trephine operations and the operation of iridencleisis appear to give the most consistent results.

Trephining operations are indicated in cases where the iris is atrophic or degenerative, and consists of removing a disc, half in the cornea and half in the sclera, after a conjunctival flap has been prepared and dissected down to the corneal epithelium.

In the operation of iridencleisis, a filtering cicatrix is formed along the track of a piece of iris which is incarcerated in a scleral wound. The wound is subsequently lined with proliferated endothelial cells from the surface of the iris and the iris stroma atrophies. A filtering wick is thus formed and, through this, the aqueous seeps out of the eye and into the subconjunctival tissues. Briefly, the operation consists of making a conjunctival flap, undermining this flap to the limbus ; an incision is made through the sclera into the anterior chamber just posterior to the limbus ; and a tag of the iris is brought out and incarcerated in the incision, following which the flap is replaced and sutured.

(3) *Cyclodiathermy* is designed to treat glaucomatous eyes in which other operations have failed to reduce the intra-ocular pressure. The purpose is to induce atrophy of part of the ciliary body by the application of a diathermic current through the sclera by penetrating or non-penetrating electrodes.

The application of this technique in the dog has been described by Magrane (1957d) and Fremming (1960).

(4) *Lendectomy* is indicated in cases of glaucoma due to subluxation or luxation of the lens, lens intumescence, or when secondary to a lens-induced uveitis.

*Absolute Glaucoma*

The pain often associated with absolute glaucoma may be relieved by the injection of 1 ml. pure alcohol retro-bulbarly. This procedure may be repeated at intervals and may also reduce the tension in the eye.

*Congenital Hydrophthalmos*

Congenital hydrophthalmos, or megalophthalmos, is seen occasionally in puppies, and relief may sometimes be obtained by frequent paracentesis and the use of miotics.

*Tonometry*

The measurement of the intra-ocular pressure may be made by means of digital palpation or, more accurately, by a tonometer (Magrane, 1957a). Digital tonometry depends on the comparison of the pressure in two eyes, by means of the index fingers placed upon the upper lids. A tonometer is placed upon the cornea, and records, by means of needle and scale, the resistance of the cornea to indentation by specific

* " Floropryl " (Merck Sharp & Dohme, Ltd.).
† " Diamox " (Cyanamid of Great Britain, Ltd.).
‡ " Daranide " (Merck Sharp & Dohme, Ltd.).

weights. Magrane records the normal intra-ocular pressure of the dog as 16 to 30 mm. Hg.

## The Cornea

*Corneal Wounds*

*Non-penetrating wounds* of the cornea may be due to such things as foreign bodies, thorns, grass-seeds, motor accidents or injuries received in fights or from cat scratches.

These wounds may often be detected by examination of the eye in a bright light, noting the change in reflection from the surface. In any case of doubt, fluorescein should be employed—this will often make visible wounds that are not otherwise noticeable.

Small foreign bodies, if not imbedded in the cornea, may be removed gently with a piece of moistened cotton wool. If imbedded in the epithelium or substantia propria, they must be removed, under local or general anaesthesia, using an eye spud or a sharp Bowman's needle.

Treatment should consist of the use of a sulphonamide or antibiotic preparation, combined with topical anaesthesia in cases showing pain or irritation.

*Simple perforating wounds* may be detected in the same way and, in addition, the anterior chamber may be found to be shallow, due to loss of aqueous humour.

Unless heavily contaminated, such wounds heal quickly. Treatment should consist of atropine and an antibiotic preparation.

*Complicated perforating wounds* will be associated with loss of aqueous humour and prolapse or entanglement of the iris in the wound. Large wounds may involve the loss of iris, lens and even vitreous humour. Deep wounds, passing farther into the eye, may produce injury to the anterior lens capsule and subsequent traumatic cataract. Wounds at the corneo-scleral junction may produce prolapse of the ciliary body and iris.

Successful treatment of iris prolapse depends on early diagnosis, to prevent massive contamination and to prevent the iris from becoming adherent to the lips of the wound. In cases where the iris is entangled in the deep lips of the wound, the use of eserine is indicated to constrict the pupil, free the iris and draw it back into the anterior chamber. Where the pupil margin is similarly involved, the use of atropine may be effective. Cases of iris prolapse should be treated by the replacement of the iris within the anterior chamber, or excision of the prolapsed part with control of the inevitable haemorrhage. Antibiotic therapy is recommended in all cases, and the use of atropine to prevent spasm of the iris and the formation of synechiae. Severe wounds, or cases where complete closure cannot be maintained, should be covered with a conjunctival flap.

Prolapse of the ciliary body is likely to be followed by extensive fibrous tissue formation within the eye and consequent obstruction to the entry of light.

In cases where there is extensive trauma, with injury to the lens, much loss of vitreous or extensive prolapse of the ciliary body, large foreign bodies within the eye that cannot be removed, panophthalmitis or endophthalmitis, the eye should be excised.

*Keratitis*

Keratitis signifies any inflammation of the cornea, and this may be accompanied with one or more of the following conditions—loss of transparency, ciliary injection, vascularisation of the cornea, cellular deposits in the anterior chamber and ulceration of the cornea.

*Loss of transparency* may be partial or complete, and is due to either oedema of the corneal epithelium, oedema of the substantia propria or infiltration of the cornea by inflammatory cells.

Oedema of the epithelium is found in cases of acute glaucoma, interstitial keratitis and iritis. It is due to an interference with the drainage of fluid from the cornea, and produces a diffuse haziness together with a diminished power of reflection from the corneal surface.

Oedema of the substantia propria is due to excessive amounts of fluid in the corneal substance and produces faint grey lines in the depth of the cornea, which may be detected with the use of an ophthalmoscope.

Infiltration of the cornea is either by leucocytes or lymphocytes which migrate either from the normal blood vessels at the corneo-scleral junction or from newly formed vessels in the substance of the cornea. This infiltration is seen as a grey-white localised haze, which may be of a yellowish colour in infected wounds or ulcers. Such infiltrations may be followed by complete absorption, or an incomplete absorption leaving either a residual opacity or cicatricial tissue.

*Ciliary injection* signifies engorgement of the circum-corneal vessels, coming from the anterior ciliary blood supply. At the same time, the conjunctival vessels are often injected.

*Vascularisation* of the cornea may be either superficial or deep, the vessels being derived either from the conjunctival vessels at the limbus, or from the anterior ciliary vessels. The new blood vessels invade the cornea from the limbus. Superficial vessels, from the conjunctiva, extend over the limbus, are continuous with the conjunctival vessels, are bright red in colour and branch widely in a tree-like fashion. A group of superficial vessels, sinuous and with many fine branches, lying between the epithelium and Bowman's membrane, and associated with some degree of grey or white opacity, is known as a pannus. Deep vessels appear at the margin of the cornea and appear from under the limbus. They are dull red in colour, and appear as long straight lines or in the form of brush-like groups ; these often coalesce to form a vascular ring.

*Cellular deposits* in the anterior chamber are an indication of involvement of the uveal tract. This will often be in the form of pus, a hypopyon, forming a grey or yellow deposit in the lower part of the aqueous humour.

*Ulceration* of the cornea may be either superficial or deep. Superficial ulceration may be difficult to detect with the naked eye, but may be easily demonstrated with the use of fluorescein.

*Acute Superficial Keratitis*

This is an acute condition, and is limited to the corneal epithelium and the superficial part of the

stroma. There is usually a co-existent conjunctivitis, and, although there is no true ulceration, the epithelium may be denuded in places. The patient will usually exhibit pain, lacrimation and photophobia, and, sometimes, blepharospasm.

The cause might be injury or infection, such as might occur with foreign bodies, trichiasis, entropion or neoplasms of the lids ; nutritional deficiencies, particularly riboflavine, rare in the dog ; the extension of a conjunctival infection ; or allergy.

Treatment is directed against the primary cause when possible. The antibiotics are of value, particularly after culture of the causal organism and sensitivity tests. Antihistaminics are indicated in cases due to allergy, and cortisone is useful to limit vascularisation. The administration of riboflavine is indicated in all cases and, in nutritional deficiencies, will produce a dramatic cure. B-ray therapy has been reported to give excellent results.

*Superficial Punctate Keratitis*

Keratitis of this type usually affects the central part of the cornea, and is not usually associated with other corneal or conjunctival disease. The cause is unknown, but thought to be of viral origin. Heeley (1958) suggests that the opacities may be due to an antibody-antigen reaction in the cells of the substantia propria.

This condition commences with the usual symptoms of pain, photophobia and lacrimation. The third eyelid is drawn over the eye, and blepharospasm and spastic entropion may be present. Fluorescein staining reveals small punctate ulcers in the corneal epithelium, and this is followed by diffuse opacity, more marked in the upper nasal and temporal quadrants. The cornea is oedematous, and a superficial vascularisation appears, the vessels invading the corneal epithelium for only a short distance. Later, this vascularisation may invade the deeper structures, and may eventually produce an interstitial keratitis. This may be followed by anterior uveitis and pigment migration and, later, retinal degeneration and xerosis of the cornea. A mass of fine vessels, forming a salmon patch, may be found at the limbus. In other cases, the disease appears to be self-limiting, the ulcerated areas forming opacities which may be permanent, or may resolve within months or even years.

Treatment is of little avail, but should be directed towards the prevention of secondary infection, and the relief of pain. The use of vitamin B1 and vitamin A in full doses is suggested.

*Interstitial Keratitis*

In interstitial keratitis, the usual irritative symptoms of photophobia, pain and lacrimation are present, and vascularisation takes place in the deep layers of the parenchyma. In the early stages, short vessels radiate in an even fashion, from the limbus towards the centre of the cornea, sometimes over the whole circumference of the cornea. Later, these vessels assume a brush-like pattern, and are more prominent. There is a thickening of the cornea, due to oedema, a gradually increasing haze of the parenchyma, and folding of Decemet's membrane. There may, also, be some superficial vascularisation and a salmon patch at the limbus.

The uveal tract is invariably involved, either in the initial stages or later as the condition develops, and this may lead to secondary cataract and, ultimately, blindness.

The aetiology of interstitial keratitis is obscure, although some cases arise as a complication of ulcerative keratitis, traumatic or operational wounds. Primary causes may be focal infections in tonsils, teeth or prostate gland ; virus infections such as distemper or hepatitis ; or leptospirosis.

Treatment must be directed to the primary cause if known, and to the anterior uveitis that may be present. Atropine is of value to lessen congestion of the iris, reduce spasm and pain and to prevent synechiae. Hydrocortisone, given locally at frequent intervals, by subconjunctival injection and systemically is recommended and Magrane (1959b) advises the use of foreign proteins intravenously. B-ray therapy has also been suggested as a useful line of treatment. Chronic cases of interstitial keratitis, seen particularly in the older Spaniel associated with a chronic mucopurulent conjunctivitis, may benefit from the use of silver nitrate, used as a 1 to 2 per cent. solution, neutralised by saline.

*Keratitis Profunda*

This condition, which is usually associated with, or more often, follows infection with canine virus hepatitis, is usually unilateral and sudden in onset. Occasional cases have been reported following the use of hepatitis vaccine.

The affected eye is usually not painful, and photophobia and lacrimation are invariably absent. The cornea, which is thickened and oedematous, exhibits a dense, diffuse bluish appearance, affecting the deeper layers of the parenchyma. The iris is sometimes involved and the author has noted 2 cases which resulted in a secondary glaucoma. Occasionally the cornea may become vascularised, but usually the condition will resolve spontaneously in 7 to 10 days.

*Keratitis Pigmentosa*

Pigmentation of the cornea is usually secondary to some other corneal or uveal disease, where vascularisation has already occurred. Those breeds in which conjunctival pigmentation is normal are naturally more prone to corneal pigmentation. The pigmentation is usually superficial, insidious in onset and progressive. Only rarely will blindness ensue, and dogs with advanced melanosis of the cornea will often retain some vision. The breeds most often affected are the Pekingese, Cocker Spaniel, Boston Terrier and Boxer, and the condition is usually bilateral. Beamer (1960) states that the condition can occur congenitally.

The primary changes are usually seen at the limbus, more often on the nasal side, as brown or brownish-black patches in the epithelium. Spread occurs on to the surface of the cornea in irregular areas, which may later coalesce.

The normal cornea contains no pigment cells, and melanosis occurs by migration of melanin from either a pigmented conjunctiva or from the uveal tract.

The conditions under which corneal pigmentation may occur are as follows :—

1. From the bulbar conjunctiva in cases of trichiasis, entropion, chronic conjunctivitis and pannus formation. In the Pekingese, it commonly arises on the inner aspect due to irritation from nasal hairs on a protruding eye.
2. Following any keratitis involving vascularisation, particularly interstitial varieties. Some pigmentation will also be caused by the deposition of haemosiderin following the breakdown of blood vessels.
3. Following corneal ulceration and penetration, resulting in anterior synechiae or prolapse of the iris. In these cases, uveal pigment migrates from the ciliary vessels and is deposited in the stroma as well as on the surface.
4. From melanotic tumours involving the limbus.
5. In cases of senile degeneration of the cornea.

Treatment of corneal pigmentation must primarily be directed against the cause if possible, involving the correction of any entropion, treatment of conjunctivitis and the removal of lashes in cases of trichiasis. Cases of melanosis associated with superficial vascularisation will resolve when the vascularisation is treated.

Hydrocortisone therapy, applied locally, systemically and, particularly, by subconjunctival injection is of great value (Uvarov, 1959).

Candlin and Levine (1952) and Dalton (1958) report good results using B-ray therapy. Dalton states that any discharge ceases in about a week, but that it is still possible to see the pigmented areas on the cornea and some very small vessels after several months.

Beamer (1960) suggests surgical treatment, scraping off the pigment with a knife, followed by cauterisation of the area with phenol, and advises the use of cortisone and B-ray therapy subsequently. Holt (1957) reports a case of melanosis treated by a circular penetrating corneal graft.

*Corneal Ulceration*

Corneal ulceration is associated with loss of corneal substance. It may or may not be associated with corneal oedema, vascularisation or pain and photophobia. The latter symptoms are more often associated with superficial ulceration than with deep involvement.

*Superficial ulceration*, associated with trauma, shows no tendency to spread and will heal rapidly, whereas, deep ulceration, involving the deeper layers of the cornea, has a great tendency to deepen rapidly and cause penetration of the cornea.

*The serpiginous ulcer*, usually associated with *Staphylococcus* or *Pseudomonas* infection, shows a necrotic centre, a diffuse keratitis and infiltration of the substantia propria, and tends to spread rapidly across the cornea, undermining the epithelium. There is little tendency to penetrate the cornea, but, in some cases, the iris will be involved and a hypopyon may be present.

*Nutritional ulceration*, or keratomalacia, associated with avitaminosis-A, is rare.

*Catarrhal ulceration* occurs in old and debilitated dogs, often as an extension of chronic conjunctivitis. Pain, photophobia and lacrimation are present, and the ulceration is seen as small, punctate ulcers, usually towards the corneal margin, which have a tendency to coalesce. Superficial vascularisation is usually present.

Magrane (1957e) reports " *Rodent ulcers* " in the Boxer—small, superficial ulcers with an overhanging border, not associated with conjunctivitis, corneal opacity or vascularisation. Marked subjective symptoms may occur at a later stage.

*Aetiology*. Corneal ulceration may result from trauma, be associated with acute or chronic keratitis or virus infections or may be trophic in origin. Those breeds with protruding eyes are particularly susceptible to drying of, and injury to, the cornea ; and, in these cases, the corneal reflex is often poorly defined and they are less " eye conscious." The cause of " Rodent ulcers " in the Boxer is unknown, and catarrhal ulceration in old dogs may be due either to an allergic reaction from bacterial infection of the lids or conjunctiva, or due to exotoxins from the bacteria present (Heeley, 1958).

*Complications*

1. Panophthalmitis—purulent infection of all coats of the eyeball as well as its contents. Symptoms exhibited are acute pain, extreme congestion, chemosis, blepharospasm, malaise and pyrexia.

2. Corneal penetration—will follow deep ulceration, whether the ulcer be large or small. The whole thickness of the substantia propria may be lost, so that only Decemet's membrane remains. The normal intra-ocular pressure causes bulging of this elastic membrane, which will project as a clear vesicle, known as a keratocele, above the corneal surface. This may or may not burst, but if it should do so through a large opening, the aqueous will flow out carrying with it the iris and possibly the lens or even the vitreous. In such cases, a panophthalmitis will follow.

If the herniation should burst through only a small aperture, the aqueous will trickle out slowly, and a clot will be formed by the membrane and by fibrin from the aqueous. The iris will often be entangled in the wound, or may herniate through the opening, becoming engorged and forming, with collected exudates and lymphocytes, a staphyloma. This will result in anterior synechia formation, and, occasionally, fistula formation. In other cases, an anterior uveitis or even panophthalmitis will result.

3. Healing of a corneal ulcer will result in scar formation. A scar from a deep ulceration may later produce a protrusion or ecstasia.

*Treatment*. Simple ulceration of the cornea may be treated by cauterisation with tincture of iodine ; and Smythe (1958) recommends the daily insufflation of finely powdered zinc oxide. Deeper ulcers, in the early stages, may be treated by irrigations and phenol cautery, followed by the use of antibiotics, but avoiding the use of cortisone until the repair process has started.

Trophic ulceration in the Pekingese may be treated with riboflavine and ascorbic acid. Serpiginous ulcers require antibiotic therapy, and catarrhal ulcers, which

should not be cauterised, will benefit from vitamin A, administered locally and systemically.

Any involvement of the iris should be treated with atropine. In cases of " Rodent Ulcers " it is recommended that the border be stripped from the ulcer and cauterised with iodine, followed by the use of atropine, ascorbic acid and niacin intravenously, and vitamin A administered locally and orally.

Other preparations that are recommended for the treatment of simple ulceration are argentoproteinum and a 10 to 20 per cent. solution of 1 per cent. silver dinaphthyl methane disulphonate.* In cases of hypopyon, penicillin may be given subconjunctivally.

In all cases in which there is a tendency to penetrate, paracentesis of the anterior chamber through a healthy part of the cornea should be performed immediately and repeated every 24 to 48 hours if necessary. This releases aqueous and reduces the intra-ocular pressure. Great care is needed to avoid damage to the iris, and the aqueous should be allowed to escape slowly. The paracentesis is best carried out, under full aseptic conditions, at the limbus on the temporal canthus.

Perforation in a peripheral corneal ulcer, with incarceration of the iris, may be treated with frequent applications of eserine sulphate, to draw the iris back into position. Mydriatics should be used in all other cases.

Where perforation has occurred, or is threatened, a conjunctival keratoplasty should be performed. An incision is made through the bulbar conjunctiva, immediately above and parallel to the limbus, so that a flap may be fashioned that will cover the ulcer completely. Two further incisions are made at right angles, one at each end of the incision, and a flap is undermined, leaving it as thick as is possible. This flap is then drawn over the ulcer, and sutured to the bulbar conjunctiva of the lower lid. The sutures will often extrude spontaneously, or are removed in 7 to 10 days.

*Exuberant Granulation Tissue*

As a result of corneal injury, ulceration or pannus formation, granulation tissue will sometimes form, and reach the point where it is no longer of value, producing an area of red, raised tissue, over and around the corneal scar. Lewis (1958) recommends peritomy in these cases, destroying the vessels in the bulbar conjunctiva on the scleral side of the limbus, by heat or electrocautery. The granulation disappears within 48 hours and the cornea regains its transparency.

*Posterior Keratitis*

This will result from anterior luxation of the lens, and produces a marked, diffuse milkiness of the cornea.

*Keratitis Sicca*

An insufficiency of lacrimal secretion, which may be either congenital or acquired, may affect one or both eyes. The conjunctiva becomes red and thickened with a ropy secretion, and the cornea becomes dry with numerous defects, taking a light fluorescein staining over the whole surface. The use of artificial tears, composed of ½ to 1 per cent. methyl cellulose is suggested (Magrane, 1959b).

*Keratoconus*

A bulging of the cornea into a cone shape maybe due to weakening of the cornea from trauma, ulceration or nutritional deficiency, or may have genetic origins. Opacity and astigmatism will result.

*Corneal Opacities*

Opacities of the cornea are the result of loss of substance, either from epithelium or substantia propria. Permanent scars are associated with the production of fibrous tissue, during the natural process of healing of an ulcer or a wound ; other opacities may be due to leucocyte or lymphocyte infiltration.

Corneal opacities are classified according to the degree of density as nebula, a faint clouding of the cornea ; macula, a definite grey opacity ; and leucoma, a dense white opacity. If a leucoma should form, with a dark spot in the centre due to attachment of the iris, this is then known as leucoma adherens.

The effect of an opacity will, of course, depend on its density and position on the cornea. Many scars appear to have little effect on the visual acuity of the dog. Others, where the cornea is extensively affected, may cause blindness. This is particularly true of the leucoma that may follow chemical injury of the cornea.

For aesthetic reasons, scars may be stained with platinum. The epithelium covering the opacity is first removed, and the area is then painted with a 2 per cent. solution of platinum chloride. This is subsequently fixed with 2 per cent. hydrazine hydrate and washed off with distilled water. The staining tends to fade in a year or two and may have to be repeated.

**Corneal Grafts**

Corneal transplantation or keratoplasty, has been practised in human ophthalmology, in some form or other, for nearly 200 years and great advances in the technique have been made in the last two decades.

A true graft is possible with the cornea, for a transparent graft retains the normal structure of the cornea, and, with the exception of the nerves, most of the tissue constituents probably survive (Stallard, 1958). Some degeneration of the elements of the graft takes place in the early stages, giving rise to a characteristic opacity, but later, new cells from the host invade the donor tissue and, in many cases, the graft will clear. Failure of a graft is manifested by opacity and not rejection by the host. The reason for this is not understood, but it may be due to an antigen/antibody reaction (Ryecroft, 1955 ; Dempster, 1959).

Only 3 references can be found of the application of this technique in the dog (Holt, 1957 ; Singleton, 1957 ; Knight, 1957). There is no doubt, however, that this procedure is adaptable to the dog, and, with the development of suitable technique, and the careful selection of cases, it should have a definite place in canine ophthalmology.

*(Concluded at foot of col. 1 overleaf)*

* " Viacutan " (Ward, Blenkinsop & Co.).

# The Place of Vaccines in the Control of Parasitic Bronchitis in Cattle

BY

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THE introduction by Jarrett and co-workers (1959) of a vaccine prepared from the irradiated 3rd-stage larvae of *Dictyocaulus viviparus* for the protection of cattle against parasitic bronchitis concerns a variety of interests in several branches of the study of disease control. The following paper deals with the epidemiological aspect and endeavours to foresee the possible outcome of the use of the vaccine on farms. The practical employment of an anthelmintic vaccine is new and there is much speculation on the ultimate outcome.

"There are three stages in the history of every medical discovery"—so I read in a biography of Sir James Mackenzie (Wilson, 1926)—"When it is first announced people say it is not true. Then, a little later, when its truth has been borne in on them so that it can no longer be denied, they say it is not important. After that, if its importance becomes sufficiently obvious, they say that anyhow it is not new." We may smile along with the kindly person who wrote those words and give it as our opinion that the present example is a valuable addition to medical and veterinary knowledge. In scientific discovery, however, there is nothing that can be regarded as absolutely new. As early as 1921 Schwartz observed the effect of sub-lethal doses of X-rays on the larvae of *Trichinella* in preventing their growth to functional maturity in the intestine of the host, although permitting their development in other ways. More recently Gould *et al.* (1955) went further and showed that it was possible to stimulate a resistance without infection in rats through the feeding of irradiated trichinous larvae.

It has been interesting during the past 30 years of parasitology to see the focus of attention moving through morphology, classification, life histories, and ecology, to the fields of epidemiology, pathology, and immunology, where it is now falling into line with the rest of the work on infectious diseases. Hence, in parasitology as in bacteriology, there is a present probing over the same difficult point as to where and how the immune bodies of the host are manufactured and by what means the parasite stimulates this response.

In view of the successful application of the principles of immunity to the understanding of parasitic disease it seems logical to turn to the principles of epidemiology when thinking of the efficiency of a new vaccine, one that has become available to practising veterinary surgeons with unprecedented expedition and that gives rise to much speculation as to the ultimate outcome when applied on farms. In his Croonian lecture on "The biology of epidemics" Topley (1942) writes: "The epidemiology of to-day is the child of parasitology, Medicine is its grandmother, once or twice removed." There is, in fact, a wide overlap in all the various fields of study of disease, the epidemiologist's view being one of the widest; in this connexion Greenwood (1919) draws a picturesque comparison between the clinician and the pathologist; "all see the same objects," he writes, "but they see them from different points of view. If we intend to study the architecture and topography of this city of Cambridge we could adopt one of three courses. We might go through the streets and colleges with a guide; we might select some representative building for special study; or we might obtain a bird's-eye view of all from an aeroplane." In order to get the best understanding from his overall picture, however, the traveller in the aeroplane would need guide books and maps, and when we apply the simile to the epidemiologist we find that such are provided by immunology and parasitology. It is from the interpretation of the broad overall view, in the light of knowledge of details, that the epidemiologist endeavours to work out the principles underlying the occurrence of epidemics of disease.

### Principles of Epidemiology

Whereas immunology may be concerned with only 2 variables, the host and the parasite, epidemiology is concerned with many. In the employment of an

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**Diseases of the Canine Eye, Part II.**—*Concluded.*

Optical indications for corneal grafting would appear to be absent in the dog, and aesthetic grafts will be rarely utilised. The main indications would appear to be corneal dystrophies, leucoma formation, thermal and chemical burns, certain types of keratitis and ulceration, and in certain neoplasms.

The guiding factor in corneal grafting is the presence of corneal vascularisation, and its extent, depth and age. In the absence of any vascularisation, the prognosis is favourable, whereas, in its presence, particularly if it affects the deeper tissues, the chance of a successful outcome is greatly diminished. Unfortunately, the condition of keratitis pigmentosa is not suitable for grafting operations, for the graft will certainly become vascularised and pigmented itself. Factors which favour success are a surround of normal corneal tissue, no anterior synechiae, and no vascularisation (Stallard, 1958).

The types of graft that may be used are either penetrating, full-thickness grafts, or lamellar, non-penetrating, partial-thickness grafts, or a combination of the two, the so-called "mushroom" grafts.

*Part III will be published in* THE VETERINARY RECORD *next week.*

entirely new immunological method for the control of a crowd disease, such as the use of a vaccine for the prevention of dictyocauliasis, we are concerned with herbage, weather, soils, agricultural procedures, age of hosts, grazing by resistant animals, and with a great complexity of inter-related factors, so that it is necessary to be guided by principles.

That the epidemiologists have not been able to provide us with very precise guides is in no small measure due to the lack of an adequate experimental background. Valuable observations have, however, been made by Greenwood, Hill, Topley, Wilson, Webster, and others, on the spread of mouse typhoid and of a virus disease, ectromelia, among large communities of mice. To attempt to apply the outcome of observations on epidemics of bacterial and viral diseases among mice in understanding the epidemiology of the disease in man may be thought a doubtful procedure, and to go still further and try to apply the same experimental findings to a nematode disease in cattle might seem entirely worthless. It will be remembered, however, that we are dealing with principles, principles that apply to host-parasite relationships wherever acquired resistance operates in a host-parasite community; useful inferences may, therefore, surely be drawn.

A principle objection, that unicellular organisms can give rise to successive generations within the host, whereas multicellular ones are unable to do so, may be met by the argument that the increase of parasitic worms, coming about through a progressively increasing rate of collection from outside, fulfils the essential requirements for the validity of the comparison. It seems reasonable, therefore, to use the results obtained from bacterial diseases in mice in our theorising about the application of helminthic vaccines and in the interpretation of observations in connexion with their success or failure in the field.

Wherever an assessment is required of the practical means of controlling a disease the application of the acid test is in the hands of the practising veterinary surgeon. It will be the accumulation of the evidence that he collects in using the vaccine during the ordinary course of his daily work that will finally give the verdict. It is on the farms that all of the many varying factors will be encountered, such as cannot be included in an isolated controlled experiment. It seems desirable, therefore, to discuss the theoretical possibilities, and to draw comparisons between the bacterial epidemics among mice, and the worm epidemics among cattle, in an attempt to formulate the questions that must be answered by the practitioners' observations.

### Outcome of Experimental Epidemiology in Mice Applied to Husk in Cattle

For the purpose of this comparison one may refer to the conclusions that appear at the end of the Medical Research Council Report of Greenwood *et al.* (1936) and see whether they fit the epidemiology of the nematode disease. In the first place observations on the mouse communities used by these workers showed *the host-parasite relationship to be such that the parasite would never become extinct*, except as an accident where host numbers are small. Their words are as follows: "The disease will never normally die out. Since in experimental practice a herd may be reduced to a very small number of individuals, it *might* happen that no individual left in it was either clinically sick or a carrier; it might happen that the disease became extinct. But we think our experience is wide enough to demonstrate that such an event would be a mere accident of small numbers." This appears also to be the position with husk in our herds of dairy cattle. There seems no doubt that the parasite is permanent in most herds, although it may temporarily disappear from small herds pending such times as it is re-introduced. The co-existence of susceptible young animals and tolerant adults, which act as carriers of the infection, produces the same epidemiological conditions, whether it concerns bacteria and mice or nematodes and cattle.

A second conclusion to extract from the work on mouse communities is that *mortality rate depends in the main on the rate of immigration of susceptibles into the herd*. This also appears to conform with the experience of parasitic bronchitis in cattle, the epidemics being associated with the introduction of susceptible young calves and yearlings which occasionally so far increase the dose of infective larvae, through heavy contamination of the pastures, that some of the resistant adults also suffer.

A third point for comparison is the conclusion from the mouse observations that *host resistance is the most important factor in determining the development or non-development of an epidemic of disease; and that natural immunisation plays a main part in the termination of an outbreak*. Greenwood *et al.* (1936) regarded an infected herd as "a highly complex system, consisting of mice suffering from a fatal infection, others in a state of infection equilibrium that ends in death or recovery at some later period, others undergoing natural immunisation by an infection of slighter degree, and a small minority not yet infected." They further conclude that "sub-lethal or latent infection is the essential factor involved in the immunisation of any human or animal herd. As an example they point out that "well over a thousand years' exposure to measles, a disease that exerts its main killing power before puberty and should hence exert a maximal selective effect, has not sufficed to lower its incidence in the slightest degree; while the immunising effect of a wave of disease is too obvious to need comment, and Stocks (1928) has recorded observations suggesting that this effect is not confined to those who pass through a clinically diagnosable infection." Repeated contact was thought by Stocks and Karn (1928) to be necessary for the maintenance of resistance, at least in those members of the community who had gone through a clinical infection.

Applying this to parasitic bronchitis we may see the natural acquisition of infection as the means by which our grazing cattle remain healthy on infected pastures and the importance of repeated contact with the parasite in maintaining the healthy resistance of the adults within the infected area.

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### Types of Epidemics

In general the above mentioned points seem to apply very well to the observed occurrences of parasitic bronchitis in our dairy herds. The conclusions that have been reached by the experimental epidemiologists on the types of epidemics also seem to apply, and are dealt with in the succeeding paragraphs. They are conveniently summarised by Webster (1930) who writes:—

"Aetiologically, *epidemics were of 3 general varieties; (a) those occurring when a virulent strain of bacteria gained access to a previously unexposed population; (b) those occurring in infected communities, when dosage was increased by some environmental agent; and (c) those occurring in infected communities, when population resistance was lowered.*" If now we try to apply these to the field occurrences of parasitic bronchitis we may see type (a) clearly enough where calves are carefully protected from infection in the farm buildings, and then, as wholely susceptible animals, are placed on infected pasture. Type (b) is, however, the commonest type for helminthic disease among grazing animals. Susceptible calves are confined to pastures from which they acquire their infestation more quickly than they are able to develop their resistance, they then suffer from disease. Type (c) is rather uncommon for helminthic disease. It is seen to the best advantage in parasitic gastro-enteritis among store cattle towards the end of a winter, during which they have been maintained on the border line of starvation. It may be presumed that towards the end of this period of privation the many larval worms which these young animals may carry and which have so far remained inhibited in their development begin to grow and cause severe disease.

I think it must be agreed that parallels may be drawn between the succession of events in the experimental epidemics among communities of mice and the observed occurrences of parasitic bronchitis among herds of cattle. It will be interesting, therefore, to reproduce the conclusions to which these same workers (Greenwood *et al.*, 1936) have arrived on the value of vaccination for control. I should like, therefore, to quote from their summary:—

"We think it has been proved that Artificial Immunisation by the most effective methods at present available, will increase the resistance of entering mice to a level at which they have, on entrance, an expectation of life not greatly inferior to that of those survivors that have experienced the full effects of selection and natural immunisation. In conformity with our findings that natural immunisation is more effective in the virus disease, ectromelia, than in the bacterial diseases, mouse typhoid and pasteurellosis, we have found that artificial immunisation against ectromelia appears to be more effective than artificial immunisation against mouse typhoid. In no case, however, is the immunity attained complete. The immunised mice die, in the long run, of the prevailing disease; nor, in mouse typhoid, at least, does the immunisation of all entrants to a herd show any tendency to bring an epidemic to a close.

"With regard to the effect of artificial immunisation on the infection rate, as opposed to the death rate, our experience indicates that the infection of immunised animals is exceedingly common, and that, at least in ectromelia and most probably in the bacterial diseases, many of the immunised and infected survivors are infective for normal mice; so that, even if it were possible to devise a method of immunisation more effective in lowering mortality than those we have hitherto employed, it is doubtful whether we should, by this method, be able to eliminate infection from our herds, and so render safe the admission of susceptible immigrants."

This conclusion conveys both a hopeful prospect and a timely warning. There is every reason to hope that the use of the husk vaccine may raise the resistance of the calves that are to be drafted into the herd to some point approximating the resistance of naturally immunised animals. This, however, cannot be expected to reach the point of complete immunity. It would therefore be an inadvisable risk to place such calves on what is known to be a dangerous pasture. The warning concerns the attempted elimination of infection from the herd. This cannot be expected to take place as a result of vaccination alone so that the free admission of susceptible immigrants into a herd must not be regarded as safe merely because the vaccine has been used.*

The conclusion on the infection of immunised animals should also be noted as a not improbable occurrence in husk as well as in mouse typhoid, and the maintenance of unobserved and unobservable infection through the use of the vaccine. Perhaps we may now turn, therefore, to the specific consideration of dictyocauliasis as it occurs among cattle on farms.

### Healthy Relationship, and Disease Relationship of Cattle and Dictyocaulus

The sequence of events in the natural, healthy relationship of cattle and *D. viviparus* appears to be for the host to develop a resistance while still young, and to maintain this resistance by repeatedly picking up infection throughout adult life: otherwise a herd of cattle may not be fitted for the maintenance of health within this country, where it is almost certain to be exposed to infection.

Suppose we consider for a moment a set of animal husbandry conditions that most nearly approach the natural relationship of calves, huskworms, and pasture. A pleasant picture may then be drawn of a group of red Hereford cows, with calves at foot, grazing the green, infected grass, where they pick up infection and grow fat. Huskworms, in fact, seem to trouble them very little indeed, although they are almost certainly present wherever the grazing of cattle is a general practice. The reason for the happy relationship is that some of the cows carry a few worms throughout the winter and bring about a

* An occurrence of this kind was reported by R. L. Cornwall and Jean Berry, in THE VETERINARY RECORD for July 23rd, 1960, pp. 595-8. Vaccinated calves had been observed to pick up an infection which led to the development of fatal disease in unvaccinated calves that were associated with them on the pasture.

light infestation of the pastures, so insuring early infection for the calves, who gradually increase their immunising dose through eating increasing amounts of increasingly infected grass. Through this safe and effective means these calves acquire a strong resistance before running the risk of too heavy a dose of infective larvae. And the resistance is maintained throughout adult life by their continued grazing on contaminated pastures.

The state of disease in the association of *Dictyocaulus* with the calves of dairy cows is mainly brought about by taking them away from their mother's milk and substituting inadequately for this infection-free nutriment. The milk-starved calves then eat more grass than normally and thereby acquire an unnaturally heavy dose of larvae. To keep the calves indoors only postpones the period of trial and adds to its severity through the increased capacity of these older animals for grass. When at last such calves are released from the farm buildings, therefore, and expected to meet the trials of an infected environment on their own account without having acquired the necessary resistance, they suffer from a disease, from which they may die.

Furthermore, it is necessary to maintain this resistance so long as the cattle have to live within the endemic area, and this must be done either by repeated vaccination or by the natural process of the repeated acquisition of infection from the pastures. It might be useful to give one or two examples from the epidemiology of other diseases in order to emphasise the importance of the point in connexion with parasitic bronchitis: first the circumstances attending the non-occurrence of babesiosis among cattle within an endemic area. In such an area the immunised cattle live healthily along with the parasite, because of repeated contact, through which they renew their infection and maintain their premunised state, whereas immigrants go down with the disease. An interesting variation of this situation is seen in the Northern Provinces of Australia, as mentioned by Mulhearn (1956), where particularly severe droughts, occurring at intervals of some years, bring about a virtual extermination of ticks so that the regular infection of cattle ceases and a susceptible community takes the place of what was a resistant one, adapted to life in the area. When the tick population builds up again, however, which it does in a period of a few years, many animals die of babesiosis. Control measures in these areas are designed to preserve tick populations at a low level without eradicating it altogether. To maintain the immunity of tick fever is the object, rather than to eliminate the ticks and so build up a susceptible herd of cattle.

Similar reactions are observed in the relationship between malarial parasites and man. Students from the infected areas of Africa, visiting Western Europe for a period of one or two years, are found to be susceptible on their return; a loss of resistance has also been observed in the personnel of West African military units on their return from service in non-malarious areas, or areas in which a different strain of malarial parasite occurs (Findlay & Markson, 1947).

These observations point to the importance of maintaining resistance by repeated contact with the parasite and the dangers of building up a susceptible group of animals within an endemic area. Although the immunological point of the duration of resistance against artificial challenge may be settled by laboratory investigation the practical outcome of the use of vaccine in the field cannot be so determined beforehand because so many variables are in operation in the field, connected with the building up of a pathogenic dose of infective larvae.

There is also a specific danger in protecting adult animals too carefully from contact with *Dictyocaulus* in that it may lead to an epidemic of the acute form of the disease. As a result of his enquiries into epidemics of the occurrence of parasitic bronchitis on farms, Michel (1959) concludes that there are 2 main epidemiological types of farm, 1 in which a certain amount of parasitic bronchitis occurs among calves almost every year, but does not occur in adult cattle, and a 2nd type of farm on which the disease does not occur among the calves but there are very occasional outbreaks of the acute form of parasitic bronchitis among the adults. Presumably, in the 1st of these 2 types, host resistance is maintained at a high level through prevalence of infection, whereas in the 2nd type it is allowed to fall through inadequacy of exposure, or perhaps has never been built up at all, because of too careful protection of the young animals. The acute form, in dairy cows (the second type of farm), is associated with ley farming, that is, with the sterilisation of the fields through cultivation for re-seeding before they are used by the milking cows. The lush growth of these re-seeded pastures tends to be reserved for the milking cows alone, so that these animals are kept away from the infected permanent pasture that is used by calves and store cattle. In the course of time, therefore, the cows lose the resistance that they had acquired as calves.

The aim, in the preventive use of the vaccine, should be not only to produce as strong a resistance as possible through the vaccination of young animals before they meet the parasite, but also subsequently to maintain the resistance at a high level. It may prove necessary, therefore, to vaccinate the whole herd occasionally in order to be sure that a wholely susceptible group of animals is not being built up. In brief, then, the questions to be answered appear to be as follows:—

(1) How long does the artificially acquired immunity last?

(2) How does this immunity compare with the immunity acquired from the grazing of infected pastures?

(3) How far is it desirable to place vaccinated calves on infected pastures in order to maintain resistance?

(4) With what regularity do vaccinated calves acquire a light degree of infestation and infect the pastures, as observed by Cornwell (1959)?

(5) How far is it desirable that they should do so?

(6) In view of the delicate nature and short life of the vaccine how far may successive batches differ in immunising power or in ability to mature and reproduce their kind?

(7) Should adults be vaccinated as well as immature animals?

(8) Is it desirable to repeat the vaccination periodically and if so how frequently should it be done?

(9) Is an effort at eradication from the farm to be encouraged or should the aim be to maintain a resistant herd by vaccination plus contact on infected pastures?

(10) Is it ever safe to cease vaccination?

(11) If vaccination may be discontinued how does one know when this may safely be done?

(12) To what extent is the susceptibility of older animals increased through diminished contact with the parasite consequent on vaccination?

These are some of the questions which at the present time we should like to be able to answer. As work on helminthic vaccines proceeds it may well be that some will no longer need an answer from field observations; the procedure is a new one and we shall soon begin to know more. One great danger in this disease, however, is our inability to determine where the parasite occurs either on the pastures or in the animals. Carrier animals may show no symptoms at all, may not even pass larvae in the faeces for periods of weeks or months. As a result the farmer may be living in a fool's paradise, supposing that he has built up a resistant herd whereas he has in fact built up a susceptible one. Topley (1942) points out that the stresses in his communities of mice were far greater than would be met under natural conditions where very effective control might have been expected from the use of a vaccine. If I may quote the last few lines of Topley's Croonian Lecture (1942) one may see that in his opinion some vaccines, at least, might lead to the elimination of an epidemic disease: "The biological system on which any endemic or epidemic prevalence depends is in unstable equilibrium, shifting now to the advantage of the parasite, now to that of the host. As we reduce the frequency of effective contact, we reduce the mass of infective material on which the probability of further diffusion in part depends. If we can tip the balance far enough the system itself will do the rest, and the disease will be reduced to negligible proportions, or even disappear."

That is the outcome for which we ultimately hope. As yet, however, we are at the very beginning of trials that are likely to be prolonged, and it will only be as a result of the accumulation of data from careful observation that we shall be able to assess the value of this new measure for control.

*Acknowledgments.*—It is a pleasure to acknowledge the help given by Professor R. Lovell of the Royal Veterinary College in discussion on many of the points mentioned in this paper.

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## FOOD IRRADIATION INFORMATION CENTRE

The world's first international information centre for food irradiation has been set up as a result of a contract signed between the O.E.E.C. European Productivity Agency and the Centre d'Etudes Nucléaires at Saclay, France. M. Pierre Lévèque has been appointed Director of the Centre, which will be set up at Saclay.

The functions of the Centre include the publication of a quarterly international newsletter on food irradiation in both English and French, and the arrangement of contacts between scientists, food technologists and the governmental and industrial circles interested. It will encourage closer international co-operation in the development and application of knowledge in the field of food irradiation.

The need for such a Centre arises from the fact that present technology is insufficient to provide the world's rapidly increasing population with an adequate diet throughout the year. Traditional methods of food preservation must be supplemented by the development of new technologies. Research has already shown that some foods can be successfully and usefully stabilised by irradiation. Such foods have been proved wholesome for man, and when tested on human volunteers in France, the United Kingdom and the United States of America have been found acceptable.

## NEW FOOD RESEARCH SECTION

A food research and nutritional advisory service has just been set up at the headquarters of Glaxo Laboratories. While mainly concerned with development of human foods the team is also concerned with animal feed supplements. The section is under the control of Dr. W. F. J. Cuthbertson, head of the biochemistry unit.

# The Eighth International Grassland Conference

The 8th International Grassland Conference was opened on July 11th, 1960, at Whiteknights Park, Reading, by H.R.H. The Duke of Edinburgh. In his address Prince Philip referred to the keeping of grazing animals as probably the oldest form of farming and expressed the opinion that this was probably the reason why grassland improvement had been so late in receiving the attention it deserves. He remarked that he was particularly glad to see that the Conference was considering the improvement of tropical as well as temperate grassland.

Dr. William Davies in the first plenary session mentioned in the course of an imaginative survey of grassland development the immense strides which had taken place in the past twenty years and gave as his opinion that this increased productivity could be doubled and even trebled in the course of the next two decades. He said that the present gathering of grassland research workers, coming as they did from all parts of the world and being interested not only in producing more grass but also in knowing how to use it to the best advantage in feeding more and more livestock, showed an immense enthusiasm which would surely not be daunted by the many difficulties which beset them. Referring to these difficulties, he said that none are greater than those which involve the full use of this increased grass production by the animal kingdom and it would seem very necessary that the veterinary profession be prepared to approach with an open mind the challenge involved in parasitisms and metabolic disease, giving the fullest consideration to new ideas which may well run contrary to their traditional methods before rejecting them as unpracticable or unworkable. In conversation with these workers it was very refreshing to hear the problems known for so long discussed from entirely new angles. This, said Dr. Davies, only emphasised the need for much greater co-operation between the many branches of agriculture. The veterinarian was not guilty of isolationism, though the grasslander was a little inclined to believe all classes of ruminant would make the same use of any particular forage crop. This could only be overcome if the veterinary profession were to take every opportunity to give constructive help in the solving of joint problems. Dr. Davies said that this approach must be at all levels, involving the practitioner in his contacts with farms, discussion groups, and Young Farmers Clubs, and the principle applied equally to the research workers at the Grassland Research Station.

*We are indebted to a correspondent for the following observations on the work of the conference.*

In his essay "On Living in a Revolution," Julian Huxley sums the matter up by saying, in effect: "Revolution is evolution speeded up. Human evolution has been getting faster and faster—its tempo during recorded history is at least 100,000 times faster than that of pre-human evolution. But the evolution of domestic animals has proceeded far more steadily; until the past hundred years or so it received no such evolutionary stimuli as were administered in the human field by the development of the plough, the spread of Christianity, the Renaissance, the French Revolution, or the Industrial Revolution."

When the present writer first started his association with domestic animals, about half-way between the wars, the ecological climate to which the ruminant was exposed, had changed comparatively little over the centuries. The introduction of rotational farming was slow and steady over a period of 150 years or so, and provided little radical change over the medieval diet, permanent pasture and meadow hay providing the mainstay of the diet to which the ruminant was conditioned. Let it be said at once that the monogastric omnivores such as the pig and man, whose digestion is mainly by enzymes, are scarcely affected by the agricultural revolution of the past 20 or 25 years. It is on the ruminant, whose digestion is so intimately bound up with its ruminal flora, that the brunt has fallen.

Attendance at those sessions of the Congress, which had a more or less direct veterinary connotation, has provided the answers to—or at any rate suggested further lines of thought upon—many questions which have been puzzling your correspondent.

Consider the changing picture of disease over the past quarter of a century. Some of it, of course, *e.g.* the much longer seasonal susceptibility of pigs to swine erysipelas, is caused by the differing marketing structure. But it is most marked in the field of metabolic disorders, to various aspects of which three Sessions of the Congress were devoted. Milk fever itself (using that term to describe the whole range of *post-partum* recumbencies) has probably not increased; but its character has changed. Some years ago, when the calcium treatment was first introduced, 2 ounces was sufficient to effect a cure in almost all cases; then one found it necessary to increase the dose to 3 or 4 oz.; now on a great many farms it is necessary to give a full range of minerals (Ca, P, and Mg) with glucose; and often to supplement this with sodii acid phosphate. The ketosis syndrome and Mg deficiency are now a commonplace in sheep as well as in cattle. Though very often the deficiencies may be *conditioned* rather than absolute, and the symptoms due to an imbalance as much as to a deficiency.

The Mg of grass follows a distinct seasonal pattern; levels are high in early spring, but fall rapidly, reaching their lowest between late April and early June, and rising again during summer. Rye-grass and *Agrostis* spp. have actually an appreciably lower Mg content than other grasses, but clover maintains a high level throughout the year. Close grazing which encourages clover at the expense of grass should therefore help to correct the seasonal deficiency. There is, moreover, experimental evidence which shows that the use of N and K fertilisers can increase the incidence of hypomagnesaemia by greatly reducing the uptake of Mg, which is rapidly followed by a decline in serum Mg values. Heavy dressings of mag. sulph. will raise the herbage Mg for a limited period, whereas calcined magnesite

XUM

(which may usefully be fed) has no effect.

It is noteworthy that fasting will produce a fall in serum Mg and Ca; this provides a rational explanation of the condition known as "transit tetany."

There has also been a marked increase of hypomagnesaemia of sheep of late years, often complicated by a severe deficiency of Ca and P, accompanied sometimes by an acute ketosis. This condition is so rapidly fatal as to give the owner the impression that losses were due to pulpy kidney disease. But pregnancy toxaemia is probably the most economically important of the metabolic disorders of sheep, and recent work has largely elucidated its aetiology. There appear 2 definite syndromes: the first occurring following prolonged and progressively more severe undernourishment in later pregnancy; and the second in previously well-nourished ewes during a virtually complete fast in association with severe environmental stress, *e.g.* snow, flood, or harsh transport. The glucose requirements of the developing foetus are very high. When the maternal intake falls below the foetal requirements, the ewe suffers from a severe hypoglycaemia, with resultant pregnancy toxaemia.

It is, perhaps, significant that the ewe's glucose depends on absorbed propionic and amino-acids: and that the level and balance of volatile fatty acids available has been interfered with by some modern methods of husbandry. Not only can they change the predominance of various rumen bacteria; they can upset the output of volatile fatty acids on whose balance depends the healthy functioning of the whole ruminant economy—weight-increase, milk production and fertility. For instance, propionic acid is a requirement both for high butterfat and s.n.f.; but it is derived mainly from the fibrous part of grass, and is thus largely absent from "properly" made silage. This finding confirms the writer's long-held view that whereas silage may be an excellent feed for young and fattening stock, it should be used only with great care and discrimination for dairy cattle.

One's general impressions of the Congress in its bearing on animal health were: firstly, that, on the whole, American workers appear primarily interested in basic research—referred to by them (perhaps a little smugly) as "fundamentals," whereas U.K., Commonwealth, and continental workers have their eye more firmly fixed on the ball on its way to the goal. Secondly, that the rate of change (which some people are short-sighted enough to think synonymous with progress) is such that basic research must now be applied as much to slow it down as to direct and encourage it.

Finally, to end on a more purely veterinary note: that while the changed emphasis in curricula from study of individual disease to preventive medicine shows a clear appreciation of the rôle the veterinary surgeon must play in agriculture, an even more positive approach to the study of the maintenance of health, in closer association with workers in allied fields, is perhaps required. A farmer is far more likely to heed the advice of a man with whom he has sat up o' nights discussing the state of the crops, the N.A.A.S., and his bank manager, than that of a scientist wished on to him from another sphere. In fact, the age-old problem of the marriage of theory and practice must somehow be solved by our educators.

P. C.

# The International Association of Veterinary Food Hygienists

*From a Correspondent*

THE second Symposium of the International Association of Veterinary Food Hygienists was held at Basle from May 16th to 21st, 1960. The following are some of the papers and contributions presented which may be of interest to veterinarians in Britain. Dr. Bartels (Germany) dealt with the necessity for uniformity in *ante-* and *post-mortem* inspection of animals, in slaughter and plant sanitation, and in meat transport hygiene in relation to those countries which have formed an economic unit such as the European Common Market and small Free-Trade Zone. Uniformity of meat inspection laws has been in existence for 2 years in those countries comprising the European Economic Federation.

Dr. Radan (Israel) discussed the relationship between the *p*H of the carcase and certain of the organs and showed that the *p*H of lymph nodes in 90 per cent. of cases was higher than that of the meat. When the *p*H of the meat was less than 6.5 the *p*H of the liver and spleen of the animal exceeded this figure, whereas when the *p*H of the meat was higher than 6.5 the *p*H of the liver and spleen was lower than that of the meat.

Experiences with the preservation of foods of animal origin by use of ionising radiation were recounted by Captain R. W. Baker (U.S.A.) who pointed out that the criteria which must be satisfied in the new form of food processing are:—

1. The food must be safe to eat (physiological investigations in regard to wholesomeness and nutritional adequacy of irradiated foods have largely been conducted on monkeys, rats and dogs).
2. The product must be organoleptically acceptable.
3. The process must be economically feasible.

The use of irradiation on foods was discussed in relation to the feeding of armed forces. Dr. Thieulin (France) dealt with the effect of ionising radiation on the bacteriological flora and showed that an irradiation of 375,000 r. appears to destroy bacteria belonging to the Salmonella, *Escherichia coli* and Pseudomonas group. Though such results are encouraging, it was stressed that further investigations must be made before the process could be applied on a commercial scale. Dr. van Keulen (Holland) pointed out the necessity for complete destruction of radioactive carcases and organs of

domestic animals and stated that the ordinary destruction plants were unsuitable for this purpose as the resultant meat meal and technical fat might still remain contaminated.

Dr. Janiak (Switzerland) dealt with the effect of tranquillisers used as food additives for animals and stated that an additional effect of these was to relax the muscles and reduce the blood pressure, thus producing better bleeding when the tranquillised animal was slaughtered; he claimed further that tranquillisers enhance the quality and keeping properties of the meat. On the other hand Dr. Käppeli (Switzerland) pointed out the public health danger in poultry castrated by hormone injection and stated that the Allen-Doisy mice test was efficacious in demonstrating the presence of oestrogens in fattened poultry.

The justification for public slaughterhouses was dealt with by Dr. Allenspach (Switzerland), a timely contribution when there is a tendency for the number of private, commercially-run establishments to increase which may constitute a source of direct competition to nearby municipal abattoirs. Municipal abattoirs, however, were likely to remain, he thought, and were indispensable provided they were capable of adapting their organisation to modern practices; such practices include line slaughter which, in the case of small and medium-sized abattoirs, has so far only been applied satisfactorily to the slaughter of pigs. Though semi-mechanisation may not bring about any increase in production per man-hour, it greatly eases the physical work entailed and secures significant improvements in hygiene. Dr. Hess (Switzerland) dealt with blood splashing in the musculature of pigs and stressed the importance (a fact already known to those with practical experience of slaughtering) of bleeding the animal as rapidly as possible after stunning.

The contribution by Linderholm (Sweden) on vacuum-packed meat products was timely in view of the great increase of such foods in recent years. The sales argument that vacuum packing greatly extends the shelf life of meat was discussed and the author suggested that such a claim was greatly exaggerated.

Dr. Sens (of Germany) pointed out that as prepacked meat foods may be spoiled in spite of their apparently normal external appearance, wrappings should be marked to indicate the date of manufacture. Among several contributions dealing with the use of antibiotics to prolong the storage life of fish, investigation by Japanese workers showed that the decomposition process in fish so treated produces a peculiar odour which was distinct from that of ordinary decomposition. Such change was brought about by the very rapid multiplication of resistant organisms, the majority of these being of the non-putrefactive type and belonging to Achrombobacter-pseudomonas, Flavo-bacterium group or other psychrophilic bacteria.

There were a number of valuable contributions on Salmonella bacteria and the infections produced by them. Dr. Clarenburg (Holland) mentioned that such infections in both man and animals had increased in recent years. Dr. Kampelmacher (Holland) and others discussed the rôle played by slaughter pigs as healthy Salmonella carriers and stressed the importance of uninterrupted refrigeration from producer to consumer in minimising the danger. Dr. Dräger (Germany) stated that in bacteriological examination of slaughtered animals Salmonellae were chiefly found in pigs and that a latent infection was likely to become systemic in pigs exhausted and weakened by hunger. The danger in congregating animals for unduly long periods in lairages was stressed, together with the need for a regular supply of animals which had been properly rested and adequately fed. Dr. Slavkov (Bulgaria) described his investigations into the resistance of Salmonella in soil, and survival periods of 120 to 150 days were recorded, a prolonged viability which was of obvious importance when investigations are made as to the source of outbreaks.

Dr. Kästli (Switzerland) dealt with milk sterilised through ultra high temperature flash heating (Uperisation), a method especially recommended when milk had to be transported long distances and continuous cooling was not possible. The temperature and time of pasteurisation adopted in Japan was dealt with in a contribution by Dr. Matsui and there were contributions on the survival of *Str. agalactiae* and *M. tuberculosis* in certain cheeses.

Those interested will be able to read a full report of the papers and discussions which, in due course, will be published in booklet form by the International Association.

# Current Literature

## ABSTRACTS

**Ornithosis in Two Railway Guards. An Occupational Hazard.** DREW, J., MAWSON, K., ELLMAN, P., & BROUGH, D. *Lancet*. **2** (1960). 18–19.

Wild and homing pigeons as a cause of human infection with ornithosis have been reported from many countries. A survey made in 1955 indicated that there was ample evidence, both serological and pathological, that both homing and wild pigeons in Liverpool have a relatively high incidence of psittacine infection. These findings appeared to justify the action of the Liverpool city council in destroying wild pigeons. In Liverpool 2 homing pigeons kept by a family were found to be serologically positive for ornithosis infection.

Homing pigeons are transported by rail to take part in races. It is usual for them to travel in cages in the guard's van and to be released at intervening stations. The existence of an occupational hazard for railway guards is suggested by the 2 cases described in this article.

In the first a railway guard aged 60 became ill. Psittacosis was suspected because of the severity of the patient's illness in proportion to the scanty physical signs and because he owned a budgerigar. This bird, however, had always been healthy and had

not been in contact with other birds. The medical diagnosis of ornithosis was confirmed by the Virus Reference Laboratory. Subsequent enquiries revealed that as a railway guard the patient often conveyed crates of homing pigeons in his van, sometimes releasing them himself. The Medical Director of the Virus Reference Laboratory considered that examination of the budgerigar was unjustified because infection from pigeons was much more likely.

The second case involved a railway guard aged 54. After some days' illness he was admitted to hospital. There, because of pulmonary involvement, he was treated with chloramphenicol. After a somewhat stormy period he made a complete recovery. The Virus Reference Laboratory confirmed the diagnosis of ornithosis. Development of antibody titre was slow ; the delay was thought to be due to the treatment with chloramphenicol. The occupational history was similar to that of the first patient. Indeed, the 2 patients were well known to each other.

It was because of the experience gained with the first case that the suggestion was made that the second case might be one of ornithosis. Without this suggestion the diagnosis might not have been made.

" Only awareness of the diagnosis of psittacosis on the part of the practitioner who sees patients will lead to advances in the knowledge of the very variable clinical manifestations and of the numerous sources of infection."

MURRAY, D. S. (*Letter to Editor*). *Lancet.* **2** (1960) 101.

This writer reported that in October, 1954, he had seen a man of 63 whose clinical picture suggested psittacosis. The Virus Reference Laboratory confirmed the diagnosis. The man revealed that he was a railway guard and carried large numbers of pigeons at least once a week.

OSMAN, W. H. (*Letter to Editor*). *Lancet.* **2** (1960). 152.

The writer of this letter is the editor of *The Racing Pigeon*. The gravamen of this letter is that the risks of ornithosis and particularly its danger to public health from racing pigeons may have been overemphasised.

It is contended that cases of ornithosis infection in wild pigeons should not be considered *prima-facie* evidence for the same probability of infection in racing pigeons. " Racing pigeons are usually kept for racing and a very high selection pressure is maintained, not only by racing itself but also by the elimination of those which are unlikely to succeed as racers. This means that in the case of racing pigeons acute or chronic infection by any disease is virtually unknown." The existence of the disease at a subclinical level is arguable, but it could hardly be maintained as a health hazard. There is not, to my knowledge, 1 case of ornithosis in human beings that has occurred as a result of keeping racing pigeons by normal methods. " On the other hand, it does seem a pity that no one inquired about the health of the owners of the pigeons, since they must suffer a far greater liability to infection " [than railway guards].

GRIST, N. R. (*Letter to Editor*). *Lancet.* **2** (1960). 207.

This writer directed attention to a report by Grant (1960) of a recent outbreak of ornithosis in Glasgow involving 2 pigeon fanciers and their flock. Serological tests in the Glasgow University Department of Virology established the diagnosis in 2 cases and in their sick and apparently healthy birds. Ornithosis virus was isolated from the birds.

**Reference**

GRANT, W. (1960). *State vet. J.* **15.** 70.

ELLENBOGEN, B. K. (*Letter to Editor*). *Lancet.* **2** (1960). 207.

This letter directs attention to an article published in the *British Medical Journal* in 1952 by the writer and Dr. C. M. Miller. This article is entitled " Psittacosis in a Family." It describes 2 cases of psittacosis involving a father and son. Tentative clinical diagnosis was established in each case by serological tests at the Virus Reference Laboratory. The 2 patients had been in frequent contact with domestic pigeons kept by a relative. Two weeks before the onset of the patients' illnesses it had been noticed 1 of the birds was sick. Chloramphenicol administered to 1 of the patients appeared to have an immediate beneficial effect. Subsequently serological proof was obtained of the existence of psittacosis infection amongst the pigeons.

**Reference**

ELLENBOGEN, B. K., & MILLER, C. M. (1960). " Psittacosis in a Family." *Brit. med. J.* July 26th, 1952. 189.

G. F. B.

**The Demonstration of Metallic Material in the Bovine Reticulum and its Value in the Diagnosis of " Hardware Disease."** FREDERICK, G. H., & WINTZER, H. J. (1959). *Dtsch. tierärztl. Wschr.* **66.** 406.

Satisfactory X-ray films can be made of the reticulum of cattle for the localisation of foreign bodies. The technical details are: 120 kV, 60-80 mAs and a focus-film distance of 40 inches. Ilford HV screens and Ilford Industrial lead screens (front 0.004 inch back 0.006 inch) were used to minimise stray radiation. The thickness of the patient about the level of the xiphoid process should not exceed 17 inches. The animal is not starved and the picture is taken in the standing position, thus the method can be used as a routine and as a useful aid to diagnosis. X-ray plates of 436 animals showed fair to good correlation with clinical findings in 89 per cent. of cases. (5 diagrams, 1 table, 4 X-ray photographs.)

**Macroscopic and Microscopic Lesions in " Mucosal Disease " in Cattle.** SCHULZ, L. CL. (1959). *Dtsch. tierärztl. Wschr.* **66.** 586.

The findings in four animals which died from mucosal disease are detailed. A diphtheroid inflammation of the whole digestive tract was characteristic and distinguished the disease from malignant catarrh, foot-and-mouth disease, and probably also from other members of the mucosal disease complex. Marked similarity was found to lesions of rinderpest which could, however, be differentiated on clinical and epidemiological evidence. (7 colour photographs.)

A. D. W.

# News and Comment

## ILLNESS OF THE C.V.O.

His many friends will be sorry to hear that Mr. J. N. Ritchie, C.B., Chief Veterinary Officer and President of the R.C.V.S., was taken ill last Friday while in Scotland. The good wishes of the entire profession will be expressed for his speedy recovery.

## R.C.V.S. TRUST

The Management Committee announce the award of the Cyanamid Fellowship to Mr. W. J. Penhale, B.V.SC., M.R.C.V.S., DIP. BACT. Mr. Penhale will be pursuing research on the aetiology and control of bacterial enteritis in calves in the Department of Veterinary Pathology of the University of Liverpool.

## THE ANIMAL HEALTH DIVISION

The following changes have been made in the veterinary field staff:—

Mr. G. D. Munro, Divisional Veterinary Officer, Llandrindod Wells, retired from the Service on July 31st, 1960.

Mr. R. G. Cullen, Veterinary Officer, and Mr. D. C. Davies, Veterinary Officer, who were stationed at Hereford and Bridgend respectively have resigned.

Mr. J. McCulloch and Miss E. A. R. Burnett have been appointed Veterinary Officers and taken up station at Lincoln and Leamington Spa respectively.

## UNIVERSITY NEWS

### London

*Veterinary Pre-clinical Examination, Part I*

Ademoyero, Jacob Olagunju; André, Pierre Gérard; Beardsall, Brian Gerald; Birchall, Barry James Wright; Chandler, Edward Alan; Cottam, Robert Edward; Cox, John Edward; Cross, Robert Samuel Newton; Crouch, James Robert Fisher; Daniel, Nicholas John; Dear, Michael George; Duncan, Colin; Frost, Richard David Ivor; Fry, Peter David; Gallagher, John; Gross, Dan; Hammond, Audrey; Harvey, Timothy Richard O'Donnell; Holmes, Michael John; Howkins, Jane Elizabeth; Isyagi, Acaitum Omanikor; Kayanja, Frederick; Kingdon, Michael; Lakeman, Jill; Le Page, Roger Lloyd; Lilley, John Keith; Linington, Keith Gordon; Lucas, Dudley Guy Dunbar; Papasolomontos, Panayiotis Anthimou; Patton, David Stewart Gurney; Piercy, David William Thomas; Poole, John; Pressland, David Edward; Price, Michael James; Rabarts, Ian Westerman; Rees, Anthony Robert; Shilleto, Michael; Sitford, Colin Rolph; Smith, Richard Harrison; Stewart, William Cadzow Lyle; Tantrum, David Charles; Thomas, Walter Howell Richard; Venables, Richard Michael; Vine, Anthony Ferguson; Walker, Robin Essington; Wells, Gerald Arthur Henry; Whitaker, Colin James; Wickham, Richard Arthur; and Wylie, David Cameron.

## PERSONAL

**Mr. John Holt,** a Sydney veterinary surgeon, will represent Australia in the 300-metres free rifle event at the Rome Olympic Games.

### Marriage

CORNWELL—BEGG.—At Sherwood Church, Paisley, on July 21st, 1960, by the Rev. Wm. Muir, M.A., Campbell Cornwell, B.V.M.S., M.R.C.V.S., to Jane Helen Begg, DIP. MUS. ED., R.S.A.M., Kelburne Drive, Paisley.

### Births

BOOTH.—On July 26th, 1960, to Jean (*née* Stringfellow) and James Morley Booth, B.V.M.S., M.R.C.V.S., of Ochiltree, Oakley Hill, Wimborne, Dorset, a daughter, Sarah Fiona.

MCCULLY.—On July 26th, 1960, to Gretta, wife of William H. McCully, M.R.C.V.S., of Churchtown, Cookstown, N. Ireland, a son, John Stephen.

## R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

BOYLE, Francis Joseph, J.P., Ashleaf, Drumskea, Ballymoney, Co. Antrim. Graduated May 20th, 1891, at the Glasgow Veterinary College. Died July 4th, 1960.

WALL, Reginald Francis, of The Willows Bungalow, Maidenhead Road, Windsor, Berks. Graduated Edinburgh, December 21st, 1896. Died August 13th, 1960.

### Commonwealth List

JAPP, Neville Gibson, B.V.SC. (SYDNEY), c/o Overseas Visitors Club, 180, Earls Court Road, London, S.W.5, was registered in the Commonwealth List of the Register of Veterinary Surgeons on July 28th, 1960.

### Supplementary Veterinary Register

MARGARSON, Edward Thomas, The Bungalow, Mundford, Thetford, Norfolk. Died August 10th, 1960.

## COMING EVENTS

### August

**August 28th to September 3rd. 78th Annual Congress of the British Veterinary Association in Glasgow.**

31st (Wed.). Annual General Meeting and Dinner of the Alumnus Association at the Royal (Dick) School of Veterinary Studies, Edinburgh, 7.30 p.m.

### September

7th (Wed.). General Meeting of the South Wales Division at the Golden Grove Farm Institute, Llandilo, Carms., 2.15 p.m.

Meeting of the B.S.A.V.A. Sussex Region at the New Imperial Hotel, First Avenue, Hove, 8 p.m.

14th (Wed.). Yorkshire Division: one-day Poultry Course at the Yorkshire Institute of Agriculture, Askham Bryan, York, 10.30 a.m.

15th (Thurs.). Meeting of the Supplementary Veterinary Register Division at 7, Mansfield Street, Portland Place, London, W.1, 2.30 p.m.

21st (Wed.). Joint Meeting of the North Wales Division with local Branches of the British Medical Association for a Symposium on Brucellosis at the Imperial Hotel, Llandudno, 2 p.m.

23rd (Fri.). First Meeting of the B.S.A.V.A. branch at the Golden Lion Hotel, Stirling, 6.30 p.m.

**October**

6th (Thurs.). Meeting of the Technical Development Committee of the B.V.A. at 7, Mansfield Street, Portland Place, London, W.1, 10.30 a.m.

## ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

**Anthrax**

*Northants.* The Lynch Holmes, Achurch, Kettering (Aug. 9).

*Wigtown.* Ford House, Glenluce, Newton Stewart (Aug. 15).

**Fowl Pest**

*Herts.* The Smallholding, Chesham Road, Bovingdon, Hemel Hempstead (Aug. 11).

*London.* 22, Baxendale Street, Bethnal Green, London, E.2 (Aug. 9); St. Mary Convent, Shernhall Street, Walthamstow, E.17 (Aug. 11).

*Norfolk.* 1, West Farm Cottages, Barnham, Thetford (Aug. 9).

*Suffolk.* The Nest Brand Road, Great Barton, Bury St. Edmunds (Aug. 11).

*Warwicks.* No. 4 Smallholding, Baginton, Coventry; No. 3 Smallholding, Baginton, Coventry (Aug. 12).

*Yorks.* 19, Ley Fleaks Road, Bradford (Aug. 11); Glenmere, New Lane, Drighlington, Bradford (Aug. 12); 31, Meanwood Road, Leeds, 7; Tomlinson Street, Leeds, 7 (Aug. 15).

**Swine Fever**

*Anglesey.* Parthamel Lodge, Llanedwen, Llanfairpwll (Aug. 12).

*Ches.* Point Farm, Sealand, Chester (Aug. 9).

*Cornwall.* Barwick, Tregoney, Truro (Aug. 12).

*Denbigh.* Rackery Farm, Burton, Rossett, Wrexham (Aug. 9).

*Essex.* Tendring, Clacton-on-Sea (Aug. 12).

*Flints.* Tan Lan Hall Farm, Tan Lan, Ffynnongroew, Holywell (Aug. 12).

*Isle of Wight.* Street End Piggeries, Station Yard, Sandown (Aug. 11).

*Kent.* Alland Grange Farm, Minster, Ramsgate (Aug. 10).

*Lancs.* Pillmoss Farm, Hatton, Warrington (Aug. 9); Higher Barker Farm, Goosnargh, Preston (Aug. 11); Bridge End Farm, Bispham, Blackpool (Aug. 12).

*Middlesex.* Research Farm, Harefield, Uxbridge (Aug. 11).

*Norfolk.* Piggeries, North and South of Church Road, Hepworth, Diss (Aug. 10).

*Northants.* Piggery, Glebe Farm, Pytchley, Kettering (Aug. 11).

*Salop.* Home Farm, Hanmer, Whitchurch (Aug. 9).

*Somerset.* Wilcox Farm, Hatch Beauchamp, Taunton (Aug. 15).

*Suffolk.* Chediston Grange, Chediston, Halesworth (Aug. 9); Eton College Farm, Creeting St. Mary, Ipswich (Aug. 10).

*Surrey.* Logmore Green Farm, Logmore Lane, Westcott, Dorking (Aug. 15).

*Yorks.* Hill Top Farm, Oakworth, Keighley; Hobcote Farm, Oakworth, Keighley; Church Farm, Tongues Lane, Meanwood, Leeds, 6 (Aug. 9); Littlethorpe House, Littlethorpe, Ripon (Aug. 15).

# Letters to the Editor

*The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.*

## GENERAL

### Obstetrics

Sir,—Normally it doesn't worry me at all that many of the things I say provoke my colleagues, but this time I am genuinely alarmed. I should hate to think that I may have incited Daphne B. Copestake to have another baby in an attempt to check my statement. The thought of her progressing through the various stages of labour with a stop watch in her hand would really prick my conscience.

Such a step is not necessary. Much better for Mrs. Copestake to re-read the textbooks she has quoted together with the many others that have been published on this subject, the names of which I will gladly furnish if she will write direct to me. Mrs. Copestake obviously has some knowledge of the subject—the author of "Middle Stump" appears to have none, though he or she certainly has a nice sense of humour and I enjoyed the contribution tremendously.

The middle stump did go and I was not worried—it was from a no ball.

Yours faithfully,
E. C. STRAITON.

132, Lichfield Road,
Stafford.
*August 12th*, 1960.

### A Television Lapse

Sir,—It seems regrettable that when this week's television programme "Good Companions" featured the P.D.S.A., the suggestion was that the P.D.S.A. is the only expert opinion to seek for sick animals. No mention was made that this service is intended solely for poor people, nor was any mention made that owners had to sign a declaration that they were unable to pay a veterinary surgeon's fee.

Could not our Public Relations department have found out about the intended production and requested the B.B.C. to remedy these omissions?

Yours faithfully,
L. R. ROBINSON.

The Grey House,
Purleigh,
Nr. Chelmsford,
Essex.
*August 12th*, 1960.

### "A Dangerous Epilogic"

Sir,—With reference to Mr. Pulsford's amusing endeavour to get rid of useless synonyms for the word "epidemiology" I should like to quote from a letter of mine which appeared in *Science* for March 11th, 1932:—

"I am acquainted with some learned men who think it an outrage to apply this most valuable word ['epidemiology'] to the spread of disease among animals, men to whom presumably the epidemiology of anthrax conveys a totally different idea from the epizootiology of that disease, but who may be puzzled to find a word for a spreading disease among insects. Surely the idea which is carried by the word 'epidemic' centres on disease, and the spread

of disease as a separate idea does not fundamentally concern the association of that disease with plants, men, animals, land, sea, Europe or America."

As an outcome of a discussion about this, among the then small group at Weybridge, a letter was addressed to H. W. Fowler, asking for a ruling; was it incorrect to use "epidemiology" when writing of spreading diseases among *animals*? Unfortunately the long-treasured reply of the distinguished lexicographer has been mislaid, but as far as I can recollect, it informed us on the etymology, that "demos" there referred, not to "man" but to "people," "community" or "race," so that the word "epidemiology" very properly referred to the study of spreading diseases among animals, as well as man.

The conclusion seems to be that bad words cannot be killed; we can only hope that during the course of a long time they may die of their own accord. It is not improbable that present activity in the study of zoonoses will help in that direction, through the need for repeated reference to the spread of one and the same disease in man, animals and sometimes in an invertebrate vector as well, all perhaps within the space of a few lines.

Yours faithfully,
E. L. TAYLOR.

Central Veterinary Laboratory,
New Haw,
Weybridge,
Surrey.
*August 5th*, 1960.

**Is it Magic or . . . . ?**

Sir,—At a time when there is widespread interest in educational matters it is of some importance to us to have up-to-date information on the trends in fields allied to our own.

In agriculture at one level this is given in the article Welsh Agricultural College (THE VETERINARY RECORD, August 6th, p. 648), and it is rather a shock to find that the proposals are for 2-year agriculture and dairy diploma courses.

From our angle the interesting point about this is that in the future, employers, both public and private, will engage the products of the agriculture course as agents prepared to discuss and advise on farming problems, not excluding those requiring a specialised knowledge of animals. Almost certainly also, some, at least, of the dairy diploma holders will join the ranks of those who are preferred to veterinarians for the task of controlling milk production in England and Wales.

How such results can be obtained from 2-year courses is worthy of consideration. Have they their origin in some mystical quality in the teaching, absence of appreciation of values in employers, or lack of interest in the customers?

The answer is of importance to us.

Yours faithfully,
JOHN C. GRANT.

Hilton of Murtle,
Bieldside,
Aberdeen.
*August 9th*, 1960.

**An Unusual Use for β-Ethyl-β Methylglutarimide***

Sir,—During the course of practice recently, a cross-bred Collie type bitch aged 7 years was undergoing caesarean section to relieve the condition of primary uterine inertia. The pregnancy was a result of a misalliance; the exact date of the mating was not recorded by the owners, but it was calculated that the bitch was at least a week overdue when presented for examination. The owners were not anxious to keep the puppies, their main consideration being for the bitch's welfare.

For this reason, and because it was more expedient on this occasion, the anaesthetic used was intravenous thiopentone sodium given fractionally to maintain a suitable plane of surgical anaesthesia. Operation revealed the presence of 2 puppies, one occupying each horn of the uterus. The first puppy was removed in the usual way and on examination was found to have been dead for some days. The second puppy appeared normal macroscopically but seemed quite moribund. However, the umbilical cord was ligated and the puppy dried, although there seemed little chance of its surviving. Later it was observed to be making intermittent feeble respiratory efforts, and auscultation of the thorax at this stage revealed slow but quite strong heart beats. Artificial respiration and other usual means of resuscitation were commenced. After some time, however, there were no signs of response, the heart beats were becoming more feeble and the puppy was obviously succumbing to the effects of the barbiturate anaesthesia. At this stage with much to gain, and nothing to lose, this puppy was given an intraperitoneal injection of 1 ml. of a solution containing 125 mg. β-Ethyl-β Methylglutarimide in 5 ml. water. Within a few minutes the respiratory movements increased in rate and depth with an improvement in heart rate. The limbs began to move in about 15 minutes, and in 30 to 35 minutes the puppy was actively seeking nourishment, and crying lustily. No further injections or supportive therapy were given and the puppy made normal progress, with an excellent growth rate subsequently.

We hope that this experience will prove of interest and possibly benefit to other members of the profession.

Yours faithfully,
G. L. B. HENDERSON,
E. K. KEYWOOD.

30, Claremont Road,
Surbiton.
*August 10th*, 1960.

* Megimide.

**Veterinary Education**

Sir,—I write in support of the sentiments so well expressed by Professor Francis in his letter in your issue of August 13th. That a medically qualified lecturer should be paid more for teaching veterinary students than his veterinary colleagues is indeed insulting to our profession. No doubt the full implication of this section of the Spens Report was not at first realised but if, as the Editor implies in his footnote, the University Grants Committee now refuses to see the anomaly we can only assume the

insult to be intended. This I find difficult to believe. I also find it difficult to believe that this body, however august, is "not influenced by outside bodies." Surely it is only a matter of the degree of pressure under which it finds itself.

It is an academic quibble to state that the B.V.A. does not accept the "*principle* referred to." What is important, and no doubt prompted Professor Francis to write his letter, is that both the B.V.A. and the R.C.V.S. seem to be prepared to accept the *fact*. Would it not be better for the B.V.A. to refuse to advertise in THE RECORD any veterinary post for which a medically trained candidate will be considered at the enhanced salary, and for the R.C.V.S. to make it known that the Principal of a veterinary school which appoints a medical man at the enhanced salary would be charged with conduct disgraceful in a professional respect in that he failed to honour his declaration "to maintain and promote the honour and dignity of this, my profession"? The question of "principle" could then be tediously debated on an academic basis *ad infinitum* if necessary.

Yours faithfully,
J. DEANS RANKIN.

6, Benett Close,
Newbury,
Berks.
*August 15th*, 1960.

### Spontaneous Diabetes Mellitus

Sir,—The article by Wilkinson and Keen followed by the letter from Olwen D. James prompts me to reply.

In about 1931 it was my fortune to contract diabetes mellitus. Was this "spontaneous" diabetes?

In about 1932 it was my fortune to contract appendicitis which required an operation. Was this spontaneous appendicitis?

In 1957 it was my fortune to contract haemolytic anaemia. Was this spontaneous anaemia?

The profession is becoming inundated with new and meaningless words which sound like "the blind leading the blind."

Yours faithfully,
L. PITCHER.

66, Coningsby Road,
High Wycombe.
*August 9th*, 1960.

## SCIENTIFIC

### *Dicrocoelium dendriticum* in a Bovine Animal in Ireland

Sir,—The purpose of this communication is to record the finding of *Dicrocoelium dendriticum* (Rudolphi, 1819; Looss, 1899) in a 1½-year-old heifer in Ireland.

This animal was born and reared on a farm in Co. Meath and, along with 3 others, was admitted to the Veterinary College of Ireland Hospital on February 2nd, 1960. Clinical examination and worm egg-counts on samples of faeces indicated that all of these animals were suffering from parasitic gastro-enteritis. This particular animal failed to respond to treatment and was slaughtered on May 25th, 1960. At the subsequent *post-mortem* examination, 5 adult specimens of *D. dendriticum* and a number of adult specimens of *Fasciola hepatica* were found in the contents of the small intestine. On examination of the liver a further 28 adult specimens of *D. dendriticum* were found and also a larger number of adult *F. hepatica*. The bile ducts were thickened though not calcified, and there was general cirrhosis of the liver. These changes in the liver were considered to have been largely due to the presence of *F. hepatica*. No *D. dendriticum* eggs were detected in the faeces of any of these animals either before or after the finding of the adult flukes at the *post-mortem* examination.

Although *D. dendriticum* has a widespread geographical distribution it has in Britain, so far, been recorded in sheep and cattle only in the islands of the Hebrides off the west coast of Scotland (Lapage, 1956).

Yours faithfully,
W. R. KELLY.

Faculty of Veterinary Medicine,
University College,
Dublin.

F. ST. G. SLEITH,
C. HATCH.

School of Veterinary Medicine,
Trinity College,
Dublin.

*August 12th*, 1960.

#### Reference

LAPAGE, G. (1956). "Veterinary Parasitology." Oliver & Boyd Ltd.

**DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN**
**Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases**

| Period | | Anthrax | Atrophic Rhinitis | Foot-and-Mouth | Fowl Pest | Sheep Scab | Swine Fever |
|---|---|---|---|---|---|---|---|
| 16th to 31st July, 1960 | | 2 | — | — | 20 | — | 46 |
| Corresponding period in | 1959 | 3 | — | — | 13 | — | 57 |
| | 1958 | 6 | — | — | 49 | — | 55 |
| | 1957 | 6 | 1 | 9 | 21 | — | 38 |
| 1st January to 31st July, 1960 | | 135 | — | 14 | 1,357 | — | 699 |
| Corresponding period in | 1959 | 135 | — | 9 | 437 | — | 695 |
| | 1958 | 102 | 3 | 111 | 371 | — | 821 |
| | 1957 | 242 | 6 | 37 | 516 | — | 568 |